THE

SURGICAL CLINICS

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TECHNIC OF SUBTOTAL THYROIDECTOMY

Frank H. Lahey

THE following technical procedures in thyroidectomy are the results now of an experience amounting to 18,000 thyroid operations They represent certain established principles which have been consistently maintained throughout our experience with thyroid surgery, but they represent also certain modifications which have gradually forced themselves upon us as our experience has increased No lengthy discussion will be necessary in an article such as this other than a statement of certain of the basic principles involved in the technic which we arrived at some years ago and which have now become quite definitely standardized in our hands

We believe that thyroid operations involve great possibilities of disaster Technical errors must be paid for at a high price The vascularity of the thyroid gland surpasses that of almost any other structure with which surgeons deal, and patients with hyperthyroidism withstand marked loss of blood badly Removal or injury of the parathyroids results immediately in a condition which is not only distressing to the patient and to the surgeon, but which may leave a permanently serious condition Injury to the recurrent laryngeal nerve not *only* limits the function of speech, but, and even more important, tends seriously to interfere with the intake of air Injuries like perforation of the trachea, unless immediately and properly handled, can and will in seriously toxic cases result in fatalities

All the above has been put down in order that I may state that, because there are such possibilities of becoming involved

in a situation serious not only from the point of view of the patient's life, but also from that of his future comfort, the outstanding part of any thyroid operation should be adequate anatomic exposure and complete control of the vascular supply of the thyroid gland   For that reason I would like to introduce my remarks with the statement that, not for others but for our own sake, and based entirely upon our own experience, we are not interested in preserving prethyroid muscles uncut   We have cut literally thousands of prethyroid muscles, and if they are severed above the point at which innervation takes place and adequately sutured, they do not lose function   We believe that with its muscles cut we can obtain much better exposure than when they are uncut   We believe that with adequate exposure we will injure fewer recurrent laryngeal nerves, take out fewer parathyroids, do more radical removals of the completely visualized thyroid, have better control of the blood supply, and do damage to the trachea less often, if ever than would be the case were we routinely to undertake the operation with the prethyroid muscles uncut

Figure 158, 1 shows the type of incision so commonly applied by everyone   It is not quite as curved or has as much swing in it as one would like to see   The thyroid incision should be such that a string of beads will hang properly over the scar   Likewise, this incision is not quite as long as would at times be necessary   Thyroid incisions should never be measured from the sternal notch but should be sighted by the eye, since if they are placed at standard level above the sternal notch they will frequently be too high in short necked individuals and not high enough in long necked ones   Figure 158 2 shows the height to which the incision should always be elevated   It is of the greatest importance that the incision be elevated well above the level of the notch in the thyroid cartilage since, if this is not done, it will be impossible to make the lateral elevation above the level of the superior thyroid arteries so that they can be visualized   In Fig 158 3 can be seen a procedure which has proven of great value to us   The edge of the sternomastoid muscle is caught in the hemostat pulled back, and the underlying prethyroid muscles separated back beneath the sternomastoid for a considerable distance thus

making possible a wider division of the prethyroid muscles and later, better exposure   Figure 158, 4 shows the clamp applied to the prethyroid muscles, the dotted line indicating the point at which the other clamp is to be applied   In insert 5 the prethyroid muscle is shown partly severed   Note the height at which the prethyroid muscles are clamped   Much of the objection to muscle cutting is due to the fact that the muscles are cut low, thus making their suture on the same level with the skin suture and also resulting in severing of the
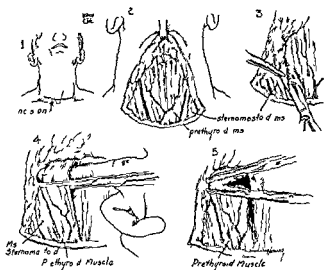
F g 158

descending branch of the hypoglossal nerve and loss of inner vation to the muscle

In Fig 159, 1 may be seen the thyroid gland with the pre thyroid muscles clamped and cut on both sides   On the right side the descending branch of the hypoglossal nerve innervat ing the prethyroid muscles is carefully preserved   Figure 159 2 shows the gland rolled inward the superior thyroid artery being exposed by retracting the common carotid artery and internal jugular vein   Note the special ligature passer which we have devised on the principle of the corkscrew so that, when

it is twisted, it carries the ligature beneath the vessel   Note
also that the ligature is passed beneath the vessels above the
point where they enter the thyroid gland   If the superior
thyroid artery and vein are tied with a segment of thyroid
tissue within the grasp of the tie the tie will frequently become
loosened postoperatively when the patient vomits or coughs
Figure 159, 3 shows the upper pole cut away   a small segment
of thyroid is frequently left attached to the pole to offset the
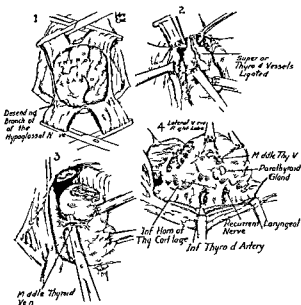
Fig 159

danger of the tie slipping   The middle thyroid vein is visual
ized and will be clamped and cut   In Fig 159, 4 it will be
seen that the thyroid gland is entirely separated from the
loose attachments to the internal jugular vein, it is then
rotated inward and turned so that the lateral surface of the
lobe is anterior   On the posterior aspect may be seen the
internal jugular vein and common carotid artery retracted out
ward   the inferior thyroid artery is visualized and the recur
rent laryngeal nerve and parathyroid gland demonstrated

One frequently hears or reads that such mobilization of the thyroid will produce stretching of the recurrent laryngeal nerve and interference with its function. We have inverted the thyroid and mobilized it in literally thousands of cases, without producing any ill effects whatever. Recurrent laryngeal nerves have been dissected and visualized in something over 4,000 cases with no ill effects whatever upon the voice
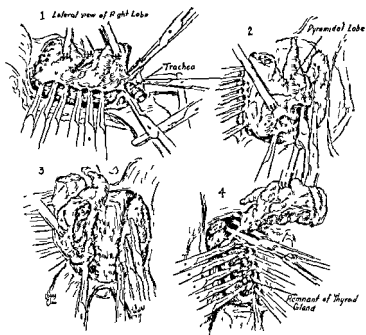
Fig 160

or function of the nerve In this period the incidence of injury to the nerve has dropped from 1 6 to 0.3 per cent

In Fig 160, 1 may be seen the row of hemostats plunged into the now lateral aspect of the thyroid gland; that portion of the gland above the hemostats is to be removed, that portion behind the hemostats is to be preserved Note the exposure of the trachea at the isthmus, the portion of thyroid attached to the trachea being so turned up that the entire isthmus will

be removed and the trachea bared Figure 160, 2 shows the further separation of the isthmus on the left side from its attachment to the left lobe In Fig 160, 3 the isthmus has been entirely removed, together with the pyramidal lobe (which may be seen in Fig 160, 2) In Fig 160, 4 that portion of the right lobe anterior to the snaps shown in Fig 160, 1 has now been completely removed, the remaining segment behind the hemostats being the remnant of thyroid which is to be left behind

In Fig 161 1 all the vessels in the remnant of thyroid have been ligated Note that the lobe has now been rotated and
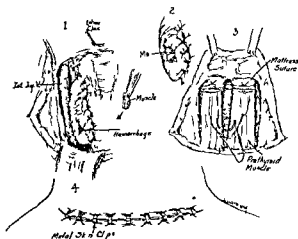
Fig 161

sutured against the trachea so that the cut and oozing surface of the gland is so buttressed against the trachea that all oozing and bleeding is controlled This technic has now been employed for several years and has been the main reason why it has been possible for us to close almost all subtotal thyroidectomies for exophthalmic goiter without drainage It has been definitely established in this clinic that postoperative reaction storms are not related to drainage or nondrainage after subtotal thyroidectomy provided the wound is left dry In this illustration also may be seen a bleeding point over which is frequently placed a small segment of muscle to be

sutured there with catgut to control the oozing, as shown in Fig 161, 2

The removal of the remaining left lobe is not shown since the technic is similar to that shown for removal of the right lobe

In Fig 161, 3 one may see the high suture of the muscles and the suture of the prethyroid muscles in the middle line Note the high level at which the muscles are cut and sutured so that the line of suture is staggered well above what is to be the skin suture When the muscles are cut low, as already
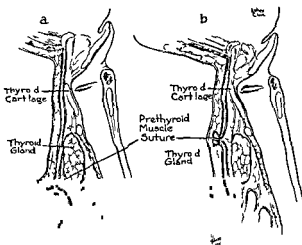
Fig 162

has been stated and suture of the muscles and closure of the skin are at the same level, an unsightly disfiguring scar will result Figure 161, 4 shows the wound closed with clips

Note that no subcutaneous catgut sutures are employed in the platysma This procedure has been abandoned now in several thousand cases and we can see no advantage in catgut sutures applied to the platysma The platysma does not pull the wound apart, and just as excellent scars are obtained as when the platysma was sutured Subcutaneous sutures tend to interfere with drainage and are, we believe, inferior to interrupted sutures with clips It is essential to remove half

of the clips on the second day and the remaining half on the third day if one wishes to avoid the holes caused by pressure necrosis when the clips are left in for a longer period

Figure 162 a shows the *wrong* method of severing the pre thyroid muscles Here the prethyroid muscles are severed low so that they are sutured at the same level as the skin Note the unsightly projection sloughing and discharge through the skin can easily occur In Fig 162 b the muscles are severed and sutured at the proper high level Note the different levels of muscle suture and skin suture This results in less danger of discharge from the wound and of the unsightly projection of the skin closure

To summarize a standardized technic for subtotal thyroid ectomy has been described which can be utilized for hyper thyroidism or adenomatous goiter The essential points are

vessels above the gland (4) complete mobilization of the lateral lobes (5) visualization of the recurrent laryngeal nerve inferior thyroid artery and inferior parathyroid (6) adequate removal of thyroid tissue including the isthmus and pyramidal lobe (7) reconstruction of the remnants with complete control of bleeding and (8) closure of the skin without separate suture of the platysma

The importance of these points has been fully demonstrated in an extensive experience

THE TECHNIC OF SECONDARY THYROIDECTOMY FOR RECURRENT OR PERSISTENT HYPERTHYROIDISM

Richard B. Cattell

Subtotal thyroidectomy for hyperthyroidism gives satis factory results in 90 to 95 per cent of cases In a recent report[1] on 4 956 patients with hyperthyroidism operated upon between 1928 and 1937, inclusive, we found that 3 5 to 5 per cent of this group subsequently had recurrent or persistent hyperthyroidism Furthermore, it was demonstrated that complications were more frequent following secondary opera tions because of increased technical difficulties In the man agement of over 400 cases of recurrent and persistent hyper thyroidism it has been necessary to develop changes in the technic of operation in order to avoid this higher incidence of complications

We have been impressed with the fact that it is frequently impossible to determine the amount of thyroid tissue in the neck following subtotal thyroidectomy by ordinary means of palpation of the gland Diagnosis must be established from the symptomatology and basal metabolism determination

We differentiate between "recurrent" and "persistent" hyperthyroidism on the basis of the presence or absence of an interval of freedom from symptoms If a patient is relieved of symptoms of hyperthyroidism and the metabolic rate re turns to normal and remains there for six months and this patient subsequently develops signs and symptoms of hyper thyroidism, this is considered to be recurrent hyperthyroidism When a patient has continued symptoms and metabolic tests do not return to normal, this is considered persistent hyper thyroidism

In Fig 163, the most common sites of thyroid tissue which causes persistent symptoms are shown Not infrequently failure to obtain sufficient lateral exposure and demonstration of the

of the clips on the second day and the remaining half on the third day if one wishes to avoid the holes caused by pressure necrosis when the clips are left in for a longer period

Figure 162, *a* shows the *wrong* method of severing the pre thyroid muscles Here the prethyroid muscles are severed low so that they are sutured at the same level as the skin Note the unsightly projection, sloughing and discharge through the skin can easily occur In Fig 162, *b*, the muscles are severed and sutured at the proper high level Note the different levels of muscle suture and skin suture This results in less danger of discharge from the wound and the unsightly projection of the skin closure

To summarize, a standardized technic for subtotal thyroid ectomy has been described which can be utilized for hyper thyroidism or adenomatous goiter The essential points are (1) a low curved transverse incision with high elevation of the upper skin flap, (2) high transverse division of the prethyroid muscles, (3) ligation and division of the superior thyroid vessels above the gland, (4) complete mobilization of the lateral lobes, (5) visualization of the recurrent laryngeal nerve, inferior thyroid artery and inferior parathyroid, (6) adequate removal of thyroid tissue, including the isthmus and pyramidal lobe, (7) reconstruction of the remnants with com plete control of bleeding, and (8) closure of the skin without separate suture of the platysma

The importance of these points has been fully demon strated in an extensive experience

THE TECHNIC OF SECONDARY THYROIDECTOMY FOR RECURRENT OR PERSISTENT HYPERTHYROIDISM

Richard B. Cattell

Subtotal thyroidectomy for hyperthyroidism gives satisfactory results in 90 to 95 per cent of cases In a recent report[1] on 4 956 patients with hyperthyroidism operated upon between 1928 and 1937, inclusive, we found that 3 5 to 5 per cent of this group subsequently had recurrent or persistent hyperthyroidism Furthermore, it was demonstrated that complications were more frequent following secondary operations because of increased technical difficulties In the management of over 400 cases of recurrent and persistent hyperthyroidism, it has been necessary to develop changes in the technic of operation in order to avoid this higher incidence of complications

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In Fig 163, the most common sites of thyroid tissue which causes persistent symptoms are shown Not infrequently failure to obtain sufficient lateral exposure and demonstration of the

superior pole of the gland results in rounded portions of thy
roid tissue being left at the superior pole or in the lateral
remnants A technic which attempts to preserve thyroid tissue
over the isthmus likewise may fail to relieve the condition
The majority of patients with exophthalmic goiter have a
pyramidal lobe This may at times not be attached to the
thyroid isthmus and can be readily missed At the initial
operation the pyramidal lobe may be a small cord of thyroid
tissue, yet it may hypertrophy late, so that it can be readily
seen over the thyroid cartilage Patients with recurrent hyper
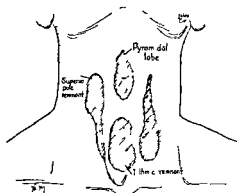thyroidism usually have diffuse enlargement of the lateral

Fig 163—Position of remnants commonly found in cases of persistent hyper
thyroidism

remnants At the time of a secondary operation it is not diffi
cult to determine whether sufficient thyroid tissue was removed
at the initial operation

The technic of excision of thyroid remnants has now be

wise the lateral dissection must be complete in order to

visualize the recurrent laryngeal nerves, so that there will be no doubt that they are left intact Control of the blood vessels is essential because of the greater danger of secondary hemorrhage Greater care must likewise be exercised to avoid injury to the internal jugular vein and trachea

TECHNIC OF THE OPERATION

The curved collar incision is used, excising the previous scar (Fig 164, a) Even though the previous incision may not be at the desired point, it will usually be best to accept this site for the incision This incision passes down to the deep cervical fascia and all tissue above this point is removed so that subsequent closure will give a good cosmetic result (Fig 164, b) The deep cervical fascia is incised in front of each sternomastoid muscle so that the latter can be retracted (Fig 164 c) The prethyroid muscles are incised in the median line, from the notch of the thyroid cartilage down to the sternal notch The sternohyoid muscle can be elevated easily, but the sternothyroid muscle will be firmly adherent to the gland remnant A clamp is passed under the sternohyoid muscle and pushed through laterally, taking care to identify the internal jugular vein The muscle can then be divided along the line of incision shown in Fig 164, c Retraction of the divided ends of the sternohyoid muscle exposes the lateral gland remnants and the attached fragments of sternothyroid muscle (Fig 164 d) The lateral remnants will be found firmly adherent by scar tissue to the internal jugular vein Retraction of the remnants medially (Fig 164, e) will permit identification of the internal jugular vein at some point from which the vein can be separated for the length of the incision New middle thyroid veins will be encountered and divided (Fig 164, e)

Elevation of the remnants with complete exposure of the superior and inferior poles now makes it possible to determine accurately the amount of thyroid tissue to be left on this side The common carotid artery is then retracted with the internal jugular vein and the inferior thyroid artery is identified (Fig 164, f) as it comes medially from beneath the common carotid artery The inferior thyroid artery is now ligated as a trunk in continuity

superior pole of the gland results in rounded portions of thyroid tissue being left at the superior pole or in the lateral remnants A technic which attempts to preserve thyroid tissue over the isthmus likewise may fail to relieve the condition The majority of patients with exophthalmic goiter have a pyramidal lobe This may at times not be attached to the thyroid isthmus and can be readily missed At the initial operation the pyramidal lobe may be a small cord of thyroid tissue, yet it may hypertrophy late so that it can be readily seen over the thyroid cartilage Patients with recurrent hyperthyroidism usually have diffuse enlargement of the lateral remnants

Fig 163—Position of remnants commonly found in cases of persistent hyperthyroidism

remnants At the time of a secondary operation it is not difficult to determine whether sufficient thyroid tissue was removed at the initial operation

The technic of excision of thyroid remnants has now become well standardized in this clinic It has been developed in order to be certain of removing sufficient thyroid tissue, and this necessitates complete exposure similar to that obtained in a satisfactory primary operation It is usually necessary to expose both lateral remnants and this is done routinely if the patient's general condition permits Great care must be exercised to prevent removal of the parathyroid glands Likewise the lateral dissection must be complete in order to

visualize the recurrent laryngeal nerves, so that there will be no doubt that they are left intact Control of the blood vessels is essential because of the greater danger of secondary hemorrhage Greater care must likewise be exercised to avoid injury to the internal jugular vein and trachea

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Routine exposure of the recurrent laryngeal nerve (Fig 164, *f*) is next carried out identifying it first in its relation to the inferior thyroid artery
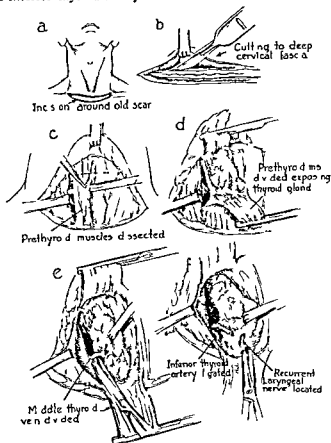
Fig 164—*a* Excision of previous scar *b* All structures above the deep cervical fascia should be excised *c* Sternomastoid muscle retracted The sternohyoid muscle is raised for division *d* Retraction of prethyroid muscles for exposure of remnants *e* The internal jugular vein is shown freed and retracted and the middle thyroid vein exposed *f* Exposure of inferior thyroid artery and recurrent laryngeal nerve

Because of the irregularity of most remnants and the dense scar tissue covering them, it is difficult to identify the para

thyroids Their preservation will depend on saving a considerable portion of the lateral pseudocapsule of the gland remnants A line of hemostats is placed on the lateral surface of the remnant (Fig 165, *c*). Following this the remnant is
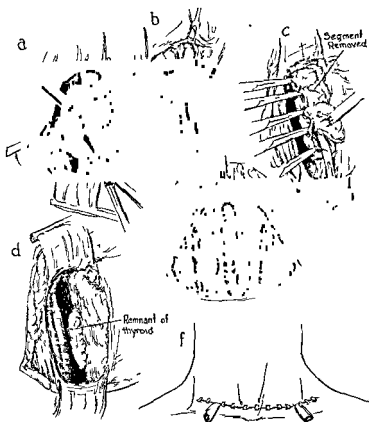
Fig 165—*a*, Freeing of trachea *b*, Pyramidal lobe exposed *c*, Lateral hemostats placed *d*, Reconstruction of small thyroid remnant *e*, Prethyroid muscles sutured transversely *f*, Wound closure completed with Michel clips, lateral drains to the gland remnants

retracted laterally and the trachea is bared in the lower portion of the incision (Fig 165, *a*) Whatever portion of the thyroid isthmus that remains is completely removed, baring the trachea and the greater portion of the lateral remnant is excised

Smaller portions of thyroid tissue should be left than in primary thyroidectomy Careful dissection is carried out over the thyroid cartilage up toward the hyoid bone, removing any portion of pyramidal lobe present (Fig 165, b) The small remnant is now folded over to the tracheal and laryngeal fascia (Fig 165 d) so that all of the cut surface of the remnant is well covered This permits reconstruction of a new thyroid lobe that is quite small and gives accurate hemostasis and a good cosmetic result

A similar procedure is carried out on the opposite side The sternohyoid muscles are then resutured transversely and longitudinally The defects between the lateral borders of these muscles and the sternomastoid muscles are left open and through this space drainage with rubber tissue or cigarette drains is instituted The skin, fat and platysma are closed

very satisfactory results and has enabled us to reduce the post operative complications The operative mortality in a series of 306 cases was 1 9 per cent which can be contrasted with a mortality of 0 67 per cent for 4 956 primary operations during the same period

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AN IMPROVED PROCEDURE FOR TRACHEOTOMY

Lincoln F. Sise and Richard B. Cattell

Tracheotomy may be performed as a step preliminary to other operations or to prevent impending or later obstruction, but it is usually done for the relief of an acute obstruction in the upper respiratory passages   For this reason it is usually an emergency procedure   The methods described have been devised to get it done as quickly as possible with the result, at times, that it is not very satisfactory   Opening the trachea by one or two strokes of a knife may be dramatic and necessary, but also may be accompanied by complications   A satisfactory method should   (1) permit the operation to be done in the best technical way, (2) should not increase obstruction either by anesthesia or the first part of the procedure, and (3) should offer relief of obstruction as soon as possible

Tracheotomy as it was performed by us in the past was not entirely satisfactory   The anesthetic employed was usually novocain by local infiltration   Respiratory obstruction, of course, was unaffected during the operation, relief being obtained only on completion of the actual tracheotomy   Because of the continuing obstruction, the operation was usually hurried and bleeding was troublesome because of the increased venous congestion   Furthermore, it was difficult to prevent blood being inhaled into the trachea   If a general anesthetic was used, cyclopropane was usually selected   Considerable relief of anoxemia could be promptly obtained by the use of helium and oxygen added to the anesthetic gas   More important, the patient under the general anesthetic was free of the fear and discomfort that was present when local anesthesia was used   Even with the use of cyclopropane anesthesia, some obstruction was still evident in spite of its being partly compensated for by the high oxygen content   Our experience with the use of intratracheal anesthesia has led us to a more satisfactory

handling of the serious problems of respiratory obstruction requiring tracheotomy

We believe that our present procedure, which will be described, overcomes the objections mentioned above It can obviously be employed only when a well trained physician anesthetist is available

The patient is first intubated under a general anesthetic For this purpose a mixture of 70 to 80 per cent helium with oxygen given under pressure with the closed gas apparatus is first used to ease the breathing, following which 8 to 12 per cent cyclopropane is added to the mixture which will give sufficient anesthesia for intubation The larynx is visualized with the laryngoscope, and the larynx and upper trachea are sprayed under direct vision with 10 per cent cocaine to prevent coughing on insertion of the tube If the obstruction is too severe to take the time for spraying, much the same result may be obtained by instilling 3 cc of 4 per cent cocaine into the intra tracheal tube as soon as it is placed A flexible metal intra tracheal tube is inserted below the point of obstruction Obstruction to breathing is then, of course, completely relieved and the surgeon can perform tracheotomy without being hurried

The anesthetic mixture is supplied from the gas machine directly to the intratracheal tube When the trachea has been exposed sufficiently and all bleeding controlled, an opening is made into the trachea between the third or fourth ring and the intratracheal tube can then be seen The anesthetist now slowly withdraws the intratracheal tube until the end passes above the opening in the trachea The tracheotomy tube is placed in the trachea with the obturator in place The obturator prevents loss of the anesthetic gas through the tracheotomy opening and the patient continues to be anesthetized through the intratracheal tube, provided the tracheotomy tube selected has not been too large (Figs 166, 167)

The operation may now be completed as deliberately as necessary At the conclusion of the procedure, the obturator is withdrawn from the tracheotomy tube, the intratracheal tube is removed, and the patient quickly recovers from the anesthetic It is probably wise to suck out the trachea and upper

bronchi by means of a small catheter passed through the tracheotomy tube at the conclusion of the operation

With this management, once intubation has been accomplished, both surgeon and anesthetist are in complete control
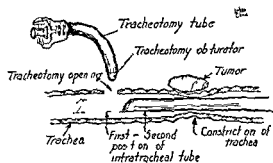

Fig 166—Tracheotomy has just been performed The dotted lines show the position of the intratracheal tube at the start of the operation and the full lines show its position as the tracheotomy tube is inserted

of the situation Relief of obstruction and anoxemia is early and complete Hemostasis may be thorough and there should be no inhalation of blood from the wound The anesthesia may be continued until the operation is finished and the dressing applied

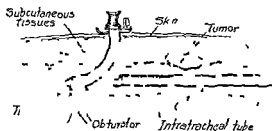Fig 167—The relative positions of the tracheotomy tube with obturator in place and the intratracheal tube are shown On completion of the operation the obturator and intratracheal tube are withdrawn

In our experience with a large number of thyroid patients tracheotomy has been necessary in 0 5 per cent Patients with hyperthyroidism tolerate respiratory obstruction, with its resultant anoxemia badly Postoperative edema may cause

a serious degree of obstruction in these cases, and tracheotomy may be necessary It should be done early in these patients with difficult breathing in order to avoid a fatality We believe there is a tendency to delay tracheotomy in these cases in order to be certain that it is necessary It is far better to perform tracheotomy early in this group of patients since it does no harm and insures a free airway The tube can usually be removed after a few days

Tracheotomy has been necessary more often in patients with carcinoma of the thyroid, for in them the trachea does not tend to resume its rounded contour after removal of the malignant goiter It may be necessary to leave the tracheotomy tube in place during the postoperative roentgen therapy

Summary —An improved method for tracheotomy is de-

operation and a controlled anesthesia throughout the procedure This method has been employed at the Lahey Clinic for three years with satisfactory results, and is most useful in dealing with the distressing complications of postoperative respiratory obstruction

REGIONAL ANESTHESIA FOR OPERATIONS ON THE NECK

Philip D. Woodbridge

Regional anesthesia may be used for almost all the operations commonly performed on the neck, in the absence of local sepsis. It produces satisfactory blocking for the usual maneuvers of cutting, hemostasis, and sewing, but occasionally traction on the esophagus or trachea produces a troublesome sense of nausea or of choking. For this reason manipulation should be gentle and opiates should be given rather liberally. On the other hand we have found that doses of scopolamine and of the barbiturates should be kept small, for the disorientation produced by larger doses of these latter drugs has led to troublesome delirium in those cases in which anesthesia was not perfect and the patient felt some degree of pain.[4]

We have dropped the use of procaine in favor of metycaine, because it is our distinct impression that this latter drug produces anesthesia more quickly and more surely than does procaine and that it lasts longer.[4] We have used the dilutions of metycaine that we should use of procaine, but it is likely that weaker solutions could be employed. Clinically, metycaine seems to be no more toxic than procaine. Toxic effects from either epinephrine or the anesthetic drug appear to be least, and anesthesia sufficiently prolonged, when 0.2 cc. of 1:1000 solution of epinephrine hydrochloride is added for each gram of the local anesthetic[4] (that is, to each 100 cc. of 1 per cent solution, or to each 200 cc. of 0.5 per cent). However, with any injection of a local anesthetic, the anesthetist should be on the lookout for signs of toxicity.

Regional anesthesia of the neck may be produced in a variety of ways, and even the same method may be variously described according to the landmarks used.[1][3] We have found

the following methods simple and effective for such operations as excision of esophageal diverticulum, block dissection of cervical lymph nodes, and thyroidectomy

With the patient supine, the anesthetist stands facing the vertex of the patient's head When the head has been turned sharply to the right, the left transverse processes of the lower cervical vertebrae may be felt as a vaguely defined ridge extending from above the middle of the clavicle toward the mastoid process The three needles for paravertebral injection are to be placed in a line which passes along this ridge and through
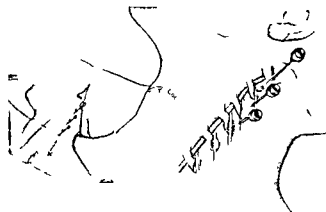

Fig 168—Paravertebral cervical nerve block Broken lines show ridge of transverse processes to mastoid process and perpendicular dropped from upper border of thyroid cartilage Note proximity of vertebral artery to needles

the mastoid process The wheal for the uppermost or superior needle is raised in this line just below the mastoid process (Fig 168) The wheal for the inferior needle is made where this same line is crossed by a perpendicular dropped from the upper border of the thyroid cartilage The third wheal is placed halfway between these two

An 8 cm needle is then passed through the superior wheal in a plane perpendicular to the sagittal plane of the head The needle is pointed slightly inferiorly or caudad so that it will impinge on the transverse process of the second cervical vertebra near its tip If it were not pointed inferiorly

but were inserted in a direction perpendicular to the skin it might pass between two transverse processes and puncture either the dura or the vertebral artery which runs through the foramina of the transverse processes. While the needle is being inserted with the right hand the fingers of the left hand should constantly palpate the ridge of transverse processes in the inferior part of the neck for it is the superior part of this ridge which is difficult to palpate the needle must reach. If the anesthetist is in doubt as to the proper direction for the needle he should first direct it too far posteriorly and successively withdraw and reinsert it in more anterior directions until the point strikes the bony ridge because there are few structures posterior to the transverse processes that could be injured by the exploring needle. When the point strikes bone at a depth sufficiently close to the skin to indicate that it is on or near the tip of the transverse process the syringe is connected to it and aspiration is made in order to make sure that the point is not in a blood vessel or in the dural sac. Six cubic centimeters of 1 per cent solution of metycaine is injected. The injection should be made slowly and aspiration should be repeatedly performed.

A second needle is similarly placed through the middle wheal. It may conveniently be 5 cm long because in this location the transverse process is nearer the skin. The same amount of solution 6 cc of 1 per cent metycaine is injected through it. This process is repeated with a 5-cm needle through the inferior wheal.

Needles thus placed rest on the transverse processes of the second third and fourth or of the third fourth and fifth cervical vertebrae in close proximity to the points of emergence of the cervical nerves from the intervertebral foramina and the solution diffuses sufficiently to block the second third fourth and fifth cervical nerves.

The next injection is along the sternomastoid muscle (Fig 169). An 8 cm needle attached to the syringe is inserted through whichever wheal lies nearest the posterior border of this muscle. The point pierces the platysma and comes to lie at the depth of the body of the sternomastoid muscle. Ten cubic centimeters of solution is injected along the middle half of its posterior border. The needle passes deep to the external

jugular vein This injection fortifies the anesthesia of the
superficial branches of the cervical plexus the small occipital
the great auricular, the superficial cervical and the anterior,
middle, and posterior supraclavicular nerves

In the preceding injections the anesthetic is placed near
specific nerve trunks, and for that purpose a 1 per cent solu
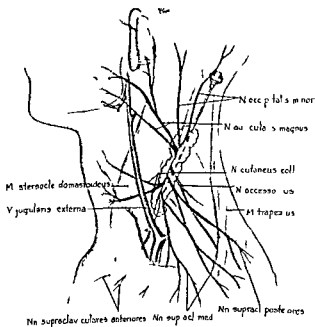tion is used Those which follow are in the nature of field

Fig 169—Poststernomastoid block of superficial branches of cervical plexus

blocks rather than nerve trunk blocks The solution is de
posited in a line or wall in order to block all nerve branches
which traverse the region and for this purpose 0 5 per cent
solution is used

If the incision is to extend near the clavicle as for excision
of an esophageal diverticulum a wheal is raised just below the
sternal notch an 8-cm needle is inserted through the wheal
and a line of 0 5 per cent solution is deposited between clavicle

and skin (Fig 170, needle *a*)   The purpose of this injection
is to block off any branches of upper intercostal nerves that
might overlap with the sensory supply from the cervical plexus

If the operation is to involve the upper part of the neck,
the overlapping fibers of the fifth cranial nerve are blocked
This is done by a line of subcutaneous infiltration of 0 5 per
cent solution from the second or middle wheal to the angle
of the mandible and thence along the border of the mandible
to the point of the chin (Fig 171, needle *a*)   If the operation
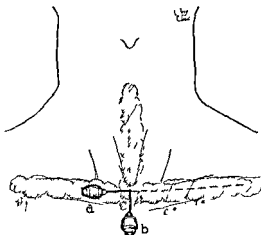

Fig 170—*a* Line of infiltration between clavicle and skin to supplement
other injections for operations that approach the clavicle   *b* Infiltration in
anterior midline of neck, to supplement unilateral injections for operations that
approach the midline

ibmaxillary
A needle
...f from the
angle of the mandible to the point of the chin, and directed
toward the eye (Fig 171, needle *b*)   It makes contact with
the lower border of the mandible, is then withdrawn and is re
inserted just medial to the mandible, and 0 5 to 1 0 cm deeper
Five cubic centimeters of 0 5 per cent solution is injected   A
similar injection is made at a point two thirds of the way from
the angle to the point of the chin (Fig 171, needle *c*)

If the operation is to involve both sides of the neck, the entire injection or any part of it may be made on the other side also without fear of trouble from paresis of the diaphragm

If the operation is to be limited to one side and is to approach the midline at any point, a line of infiltration should be made along the midline at that point in order to anesthetize fibers that overlap from the other side (Fig 170, needle b)

For operations on the thyroid gland, the paravertebral and poststernomastoid blocks are done, and an additional injection should be made just anterior to the midpoint of the anterior border of the sternomastoid muscle   The needle is inserted
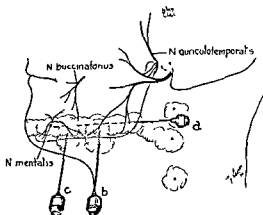

Fig. 171.—a Infiltration along border of mandible and b and c in floor of mouth to supplement other injections for operations that approach the chin

in a direction perpendicular to the skin until its point reaches the level of the deep surface of that muscle   With frequent aspiration, 5 cc of 0 5 per cent solution is injected   As an alternative or supplement to this injection by the anesthetist, the surgeon may infiltrate the region of the superior pole of the thyroid after he has exposed it

For operations on the larynx the paravertebral and post sternomastoid injections are made and in addition the superior laryngeal nerves are blocked in the following manner   The greater cornu of the hyoid bone is made prominent by pressure on the cornu of the opposite side, a wheal is raised 1 cm

inferior and 2 cm anterior to the extremity of the cornu, and through it a needle is passed, parallel to the hyoid bone and directed posteriorly between it and the upper border of the thyroid cartilage The point of the needle must not pass posterior to the posterior extremity of the hyoid bone   The patient is instructed to raise his hand (rather than to speak) when there is any sensation referred to the ear   If paresthesia is obtained, 2 cc of 2 per cent solution is immediately injected If none is obtained, injection is made in the needle tract while it is being withdrawn [2] If coughing or stridor occurs, the injection should be interrupted immediately [3]

For laryngectomy the surgeon should in addition infiltrate 0 5 per cent solution posterior to the larynx after the dissection has approached this region

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TWO STAGE REMOVAL OF THE PULSION TYPE OF ESOPHAGEAL DIVERTICULUM

FRANK H. LAHEY

THERE have been operated upon now in this clinic 104 patients with pulsion esophageal diverticula All of these operations have been carried out in two stages except two in which cases the patients were too ill to do the second stage with safety In both of these latter cases the sac was completely mobilized and implanted high (see Figs 172–175) and the results so far have been quite satisfactory

The technic of the two stage operation is well illustrated in the accompanying drawings

In Fig 172, *a*, may be seen the longitudinal incision in front of the left sternomastoid muscle It is possible to undertake these procedures with the transverse goiter incision, but since the dissection in the region of the recurrent laryngeal nerve and the complete dissection of the cricopharyngei and constrictor fibers from about the neck of the sac may be quite difficult, it is, we believe, desirable to have the wide and adequate exposure that the longitudinal incision offers For that reason the operations have all been undertaken through long incisions in front of the anterior border of the sternomastoid muscle In Fig 172, *b*, may be seen the sternomastoid muscle retracted in one direction and the prethyroid muscles retracted toward the median line Between the two clamps is the omohyoid muscle, this has always been severed and its upper portion excised in order to expose the neck of the diverticulum more adequately In the upper portion of the wound (Fig 172 *c*) may be seen the superior thyroid artery, the inferior horn of the thyroid cartilage and the lower fibers of the inferior constrictor muscle It is at the point marked "x" that one must be careful not to injure the recurrent laryngeal nerve,

since at this point the nerve penetrates the larynx to become intralaryngeal The middle thyroid vein is shown between the clamps, the left lobe of the thyroid gland is retracted toward the median line

In Fig 173, *a*, the sac has been freed from its position beside the esophagus and from the upper part of the mediastinum, it is held up by noncrushing Babcock forceps and the dissection is being started, separating the fibers of the crico pharynge and lowest fibers of the constrictor from the neck of the sac Note particularly the longitudinal esophagus and the completeness of the dissection of the neck of the sac at the angle made by its neck and the longitudinal esophagus If this
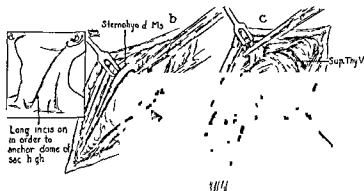

Fig 172

dissection is not completed, there will be a shelf of esophagus left after removal of the sac which *will* throw food out into the wound and result in persistence of the sinus In Fig 173, *b*, the sac has been completely dissected and a piece of rubber dam has been tied about the neck of the sac so that it will be kept as a neck and easily found at the second stage Note that the sac has been implanted upward and is anchored by two black silk sutures to the prethyroid muscles where it can readily be found at the second stage

The plan of putting a small strip of rubber dam about the neck of the sac, which I devised a short time ago and have applied in the last four or five cases, has proven very valuable

since the necks of these sacs are often quite large and difficult to find and demonstrate at the second stage With a small
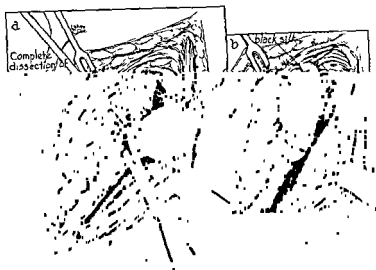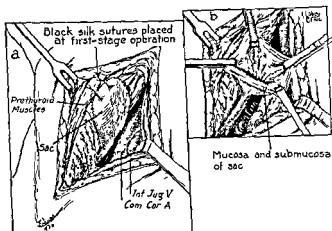

Fig 173

Fig 174

piece of rubber dam sutured about it, it can be found much easier. The first stage is completed by placing a cigarette

drain into the mediastinal space and by closing the skin incision with Michel clips

Figure 174, *a* represents what one sees at the second stage, which is done after an interval of ten days With the wound reopened one finds the sac approximated to the larynx in the
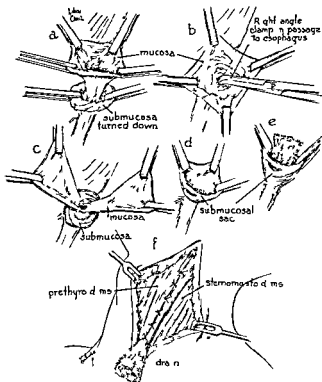

F g 175

position shown the black silk sutures are then found and cut the sac mobilized, and its top cut away as shown in Fig 174 *b* When the top of the sac is cut away one may readily observe that the mucosa and submucosa have become edematous and can readily be separated without profuse bleeding

In Fig 175, *a* is shown *the submucosa separated from the*

mucosa This frequently cannot be done with a small sac, but
if a large one is present, the dissection is easy With the mu
cosa separated from the submucosa down to the neck of the sac,
the submucosa can be rolled down and preserved In Fig 175, b
is shown a right angle clamp inserted into the longitudinal
esophagus to demonstrate that the mucosa has been freed well
down to the esophagus itself In Fig 175, c the tube of freed
mucosa is cut above and below into equal parts in order that
it may be completely severed down to the point where the
mucosa enters and lines the longitudinal esophagus The
dotted lines show the extent of removal of the mucosa The
small tabs of mucosa are then tucked into the esophagus and
the submucosal sac is shown pulled out Into this is packed
a piece of gauze which will be left for four days and brought
out through the wound as shown in Fig 175, f Following
removal of the gauze the submucosa will collapse and organize
to form scar tissue and reinforce the small defect in the esopha
geal wall

There has been but one death in the 104 cases in which
this operation has been done The operation is done entirely
under cervical block anesthesia It can be done under this
type of anesthesia with no pain whatever, and the results have
been extremely satisfactory

It is desirable we believe, no matter what type of operation
is done on an esophageal diverticulum to institute postopera
tive dilatation three or four times at intervals of two to three
months for the first year after operation It has always been
our opinion that since a pulsion diverticulum really represents
a herniation of mucosa through muscularis and the operation
causes this defect to be replaced by scar tissue, it would be
desirable to institute dilatation of this scarred region for at
least one year It is but fair to say, however, that with pa
tients living at such distance that this could not be undertaken,
the results have still been very satisfactory

THE TECHNIC OF CHOLECYSTECTOMY
AND CHOLEDOCHOSTOMY

FRANK H. LAHEY

ANY operation for gallstones should be so planned that not only is it possible to visualize the entire gallbladder and its anatomy at the point where the cystic duct joins the common and hepatic ducts, but that it is also possible to visualize the common and hepatic ducts When it is realized that in our experience with gallstones up to the present time the common bile duct is opened in one of every three cases, and common duct stones are found and removed in one of every six cases in which we operate for gallstones, it is evident that the plan of operation should always include demonstration and exposure of the common and hepatic ducts

We have no feeling for or against transverse incisions, but we have consistently employed longitudinal right rectus incisions of considerable length and with these have been able to obtain most satisfactory exposure and closure The matter of incisions, we believe, is largely a matter of individual choice

With a right rectus incision the gallbladder is grasped at its tip a wet gauze pack is placed over the duodenum, and by means of Deaver or right angle retractors the duodenum, pylorus and hepatic flexure are so rotated inward that the common bile duct is so placed on a stretch that the foramen of Winslow becomes plainly visualized (Fig 176) Into the foramen of Winslow a gauze pack is immediately introduced We believe that this is an important point since should bile escape or blood accumulate in this region, it tends to gravitate in such a manner that a subdiaphragmatic abscess may result By placing the common bile duct on a stretch it is unnecessary to employ any bar, bag, or cushion beneath the back for elevation of the field

ampulla of the gallbladder pulls out the convolutions of the cystic duct so that structure now may be safely dissected up to the point where it enters the common duct

In Fig 180 the cystic artery having been tied and the cystic duct dissected up to the point where it enters the common bile duct a right angle clamp is now inserted beneath the cystic duct to elevate it and to demonstrate its point of entrance into the common duct In insert *a* is shown the method of clamping and cutting the cystic duct Note the method of

F. 179

passing a tie down the right angle clamp twisting the clamp so that the tie remains beneath the clamp and in a deep hole can be tied with security about the cystic duct

In Fig 181 the gallbladder has been removed the peritoneum over the cystic duct and cystic artery has been sutured and the bed of the gallbladder is now being closed It is very desirable to suture the peritoneum over the stump of the cystic duct and the cystic artery in order that any cigarette drain placed down in this region may not pull the tie off of the end of the cystic artery This occurred once in my experience

and caused a fatality It is also desirable to reperitonealize this area completely in order to prevent adhesions between the

Fig 180

duodenum and pylorus and these structures Note again in this illustration the pack still below the foramen of Winslow

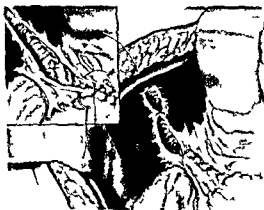Fig 181

In Fig 182 the gallbladder has not been removed This is quite desirable in the presence of severe jaundice of un

determined cause, but when common bile ducts are to be opened and searched for stones when stones are present in the gallbladder, it is considerably easier to approach and explore the common duct after the gallbladder has been removed

In this illustration the common bile duct has been incised and held apart with Allis forceps Note the suction apparatus close to the duct As soon as the common duct is incised the suction apparatus should immediately catch any

Fig 18

discharge of bile, it should then be inserted up into the liver and completely evacuate the liver of its retained bile to prevent soiling from any accumulations of bile which remain in the upper biliary ducts In inert a are shown the types of

are so frequently overlooked In insert *b* are shown the Bakês
dilators which are used to dilate the sphincter of Oddi Fol
lowing the removal of stones all sphincters of Oddi are dilated
up to from 9 to 11 mm

In Fig 183 a catheter is shown inserted into the common
bile duct after the sphincter of Oddi has been dilated By
means of a syringe the duodenum is then irrigated with salt

Duodenum
Dilated

Fig 183

solution washing back any detritus which has accumulated
as a result of fragments of stones breaking off in their removal
at this point It has not been necessary in our opinion to
carry out roentgenologic examinations during the operation on
the common bile duct with lipiodol or other opaque solutions
With good exposure and with dilatation of the sphincter, it
is possible, we believe to extract practically all stones through

the duct and to wash any small remaining fragments into the duodenum

Following the removal of the gallbladder, a rubber T tube with short transverse limbs is sutured into the common bile duct snugly so that there will be no leakage of bile When there is no dilatation of the duct and very little infection these T-tubes are removed on the twelfth day When there is marked dilatation of the common and hepatic ducts, with marked infection and long standing jaundice, the T tubes are left in for two months or more and the patient is instructed to clamp the tube during the day and to permit it to drain at night

In all cases in which cholecystectomy has been performed drainage is instituted A cigarette drain is not inserted down to the stump of the cystic duct, for the gauze coming out of the end of the cigarette drain blocks the opening of the foramen of Winslow It has always seemed to us that whether or not the peritoneum over the bed of the gallbladder is accurately sutured there will be gravity drainage of serum and blood to this point

These cigarette drains are removed on the seventh or eighth day, no attempt being made to remove the drain before this time By this time a tract has formed and there will be no danger of the drainage canal collapsing Following the removal of the drain, a rubber catheter is inserted to the bottom of the drain hole and gradually shortened With this pro-

We have so frequently encountered accessory ducts which have drained bile postoperatively that we have no interest in the closure of the abdomen without drainage after cholecys

drainage in our cases

Prior to January, 1939, we had operated upon 2 346 patients who had gallbladder disease Approximately 95 per cent of them had stones in the gallbladder or ducts The com

mon duct was opened and drained in 806 cases (33 5 per cent)
Common duct stones were removed in 353 cases (15 per cent)
In more recent years, the common duct has been opened in
approximately 45 per cent of cases, with an incidence of com
mon duct stones of 18 per cent   There were eighty seven
deaths (3 8 per cent) in this series of 2,346 patients   Of
these, thirty two occurred in cases of common duct stones (9
per cent)   Five patients died who had common duct drainage
without stones being found, one of these had a severe degree
of hepatic cirrhosis and another, a choledochoduodenal fistula
The mortality in the presence of common duct stones (9 per
cent) should be contrasted with that of 3 8 per cent for the
entire series   This demonstrates the danger in delaying opera
tion for gallstones since they may pass into the common duct
at any time   We urge early operation for gallstones and
recommend exploration of the common duct in 35 to 45 per
cent of these cases

THE TECHNIC OF SUBTOTAL GASTRECTOMY

Samuel F. Marshall

Subtotal gastrectomy has gradually been accepted in this country as a rational method for the surgical management of patients with peptic ulcer which has failed to respond satisfactorily to medical measures. The unsatisfactory results, together with the too frequent recurrence of ulcer and the complications following the employment of the more conservative measures such as gastro enterostomy, have led us to employ subtotal resection of the stomach at the Lahey Clinic in an increasing number of selected cases, and we believe, with more certain and more complete relief of ulcer distress than formerly.

We wish to emphasize that no one type of operation should be applied to all individuals suffering from peptic ulcer, to advocate subtotal gastrectomy for all ulcer patients would inevitably result in a prohibitive mortality. We are of the conviction however, that the large majority of patients with ulcer will obtain more lasting relief of symptoms and will have less frequent recurrences of ulcer if subtotal gastrectomy can be done without incurring too great an operative hazard. Furthermore, for some time it has been our firm conviction that gastro enterostomy as a routine measure for the treatment of patients with ulcer should be abandoned and that such a procedure should be applied only to patients who are past middle age whose gastric acidity is low and who have considerable cicatricial pyloric obstruction.

With the employment of such an extensive surgical procedure for benign lesions of the stomach and duodenum have come certain technical problems which have required considerable surgical experience and judgment to solve. European surgeons have advocated and employed for some years extensive removal of the stomach for ulcer and have reported astonishingly low mortality figures as well as excellent postoperative

results Apparently resection has been used for all types of
peptic ulcer including the simple uncomplicated duodenal ulcer
of the anterior wall as well as the more serious penetrating
adherent lesion The actual removal of a considerable portion
of the stomach can be accomplished with surprisingly little
risk in the great majority of cases but it is in the more serious
complications of ulcer that the high operative hazard is en
countered and it is with these serious complicated ulcers that
subtotal gastrectomy should be considered most frequently as
the method of choice

The operative mortality following subtotal resection for
uncomplicated ulcer should of course be low to justify its
employment and should compare favorably with that accom
panying conservative procedures such as gastro-enterostomy
gastroduodenostomy and pyloroplasty The actual removal of
the major part of the stomach is not a particularly hazardous
procedure in most instances The difficulty comes with the
removal of adherent penetrating lesions of the stomach and
duodenum particularly those ulcers of the posterior wall of
the duodenum which have penetrated deeply into the pancreas
and which have become densely adherent to this vascular organ
and to the surrounding structures It is in this type of case
especially that subtotal gastrectomy should be employed and
too it is with this type of case that great technical difficulties
and vastly increased operative risk are encountered factors
which enhance the possibility of a fatal outcome following
resection In a study of 130 cases in which subtotal gastrec
tomy was done in this clinic we have found that a high per
centage of the duodenal ulcers are such perforating adherent
lesions of the posterior wall It was with the hope of reducing
the high operative mortality in this type of case that we have
gradually developed the technical procedure to be described

It is not our intention to claim any originality for the
various operative steps indeed few steps in any operation are
so fully described heretofore in many papers by other writers are
original It is rather our intention to describe in detail the
techn c of subtotal resection that we have employed routinely
in the Lahey Clinic during the past two years This method
has enabled us to overcome many technical problems pre
viously encountered and to simplify the operative procedure

—all of which has tended toward a lowered mortality rate, a more satisfactory immediate postoperative course, and better final results in the surgical care of the patient subjected to such an extensive operation During the past two years we have performed subtotal resection for ulcer of the stomach or duodenum in sixty eight consecutive cases with one fatality In nine of these cases resection had been performed for gastrojejunal ulcer arising after previous gastro enterostomy, and in one case an extensive resection for gastrojejunocolic fistula was done

We have not advocated surgical management for patients with simple, uncomplicated ulcers and, if great care is exercised in choosing the patients to be submitted to operation only a relatively small percentage will require operation for the relief of their symptoms—in our experience but 8 per cent of patients with duodenal ulcers and 23 per cent of patients with gastric ulcers We have emphasized in previous communications that hardly any patient is submitted to operation without a careful and prolonged medical trial, either under the super vision of members of our own gastro enterologic division or under the direction of other internists

The indications for operation, then, are (1) ulcers which are intractable to medical management, (2) two or more gross hemorrhages, (3) ulcers which have perforated, (4) pyloric obstruction which is not amenable to medical management, and (5) gastric ulcer in which the question of malignancy arises

If gastric resection appears to be advisable, there are many methods by which it can be safely accomplished The amount of the stomach which should be removed is an important con sideration and if such an extensive procedure is justified, we must remove enough of the stomach to change the gastric secretion Pylorectomy and antrumectomy fail to accomplish this and yet are accompanied by a mortality as great as that for high resection of the stomach At least three fourths to four fifths of the stomach should be removed to change ap preciably the gastric secretion (Fig 184)

We have gradually adopted the Hofmeister modification of the Billroth II operation and, during the past two years, we have employed this method for gastric resection almost ex clusively with excellent results

A left rectus incision is made, splitting the fibers of the rectus muscle longitudinally near the medial border of the muscle The incision must be adequate and extend from the costal margin to below the level of the umbilicus We prefer to use a left rectus incision because the pylorus normally lies only slightly to the right of the midline, and this permits a better approach to the body and lesser curvature of the stomach, which is desirable in performing a high resection (Fig 185) The steps of the procedure for subtotal resection for ulcer or carcinoma of the stomach as now employed at the Lahey Clinic will be given in detail below The method also
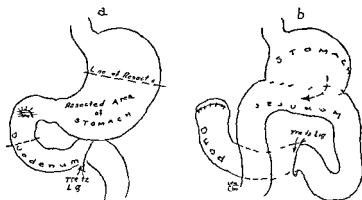
Fig 184—Hofmeister method of subtotal resection of the stomach a extent of stomach and duodenal resection b Hofmeister type of gastrojejunostomy

readily permits radical resection of the stomach for carcinoma with wide removal of the tumor and involved glands with the exception that a more extensive resection is done for carcinoma, the operation is essentially the same as that done for benign ulcer   Naturally, more attention is paid to removal of involved glands in carcinoma and recently we have also in a few cases completely removed the omentum along with the involved stomach

A thorough abdominal exploration is first carried out and the situation and character of the gastric or duodenal lesion is determined If malignancy of a gastric lesion is suspected glandular involvement is searched for If the ulcer is in the

duodenum the amount and situation of the inflammatory exudate is noted together with the extent of the fixation of the ulcer to the pancreas common bile duct and liver Before any attempt is made to mobilize the stomach in preparation for resection one must decide if the ulcer can be removed and still allow sufficient length of the duodenal tube to remain to permit *safe inversion and closure without encroaching upon the common bile duct where it opens into the duodenum*
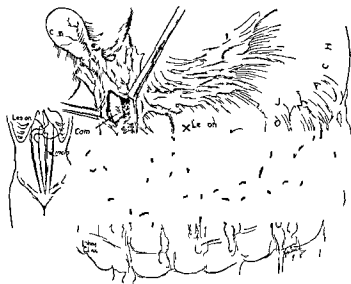

Fig 185 Abdomen opened through left rectus incision (insert) extending from costal margin to below umbilicus The location of the common bile duct and its relation to the duodenal ulcer is determined by incising the gastrohepatic omentum and by mobilizing the convex border of the duodenum

In many cases the duodenal ulcer is on the posterior wall with the exudate and inflammatory tissue involving the superior or inferior border of the first part of the duodenum If an incision is made lateral to the convexity of the first part of the duodenum the duodenum in most instances can be mobilized without too great difficulty and the relationship of the ulcer to the gastrohepatic omentum and common bile duct can be visualized (Fig 185) The common bile duct must be

clearly seen to avoid injury to it, and with some adherent penetrating ulcers, it may be impossible to remove the ulcer and still have sufficient duodenum to invert safely above the ampulla of Vater
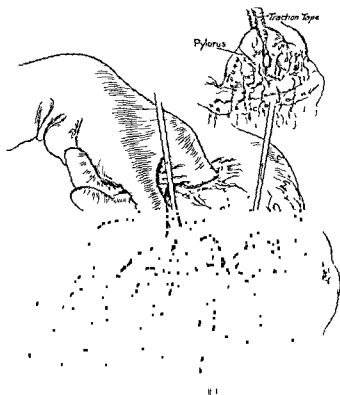
curvature of stomach is is opened by division sted through the non vascular area above the lesser curvature carried posterior to the stomach and out through the rent in the gastrocolic omentum A cauric strip is passed posterior to the stomach at these openings and used as a traction tape (insert)

If a gastro-enterostomy is present the technical difficulties may be considerable, but a most painstaking dissection must be made to visualize the anastomosis accurately and to permit

safe lysis of the gastro-enterostomy before proceeding with the resection.

The method having been decided upon, mobilization of the stomach is begun The greater curvature of the stomach is then grasped with Babcock tacking forceps and raised, which

Fig 187—Mobilization of the stomach Showing division and ligation of vessels in gastrocolic omentum The stomach is elevated by traction tape The location of the middle colic artery in the transverse mesocolon is shown The gastrocolic omentum and mesocolon are adherent in this area but can be separated easily by sharp dissection through a nonvascular layer, thus readily exposing the middle colic artery

permits a transparent, nonvascular region of the gastrocolic omentum to the left of the pylorus to be opened with the scissors. This maneuver allows air to enter the lesser omental cavity and readily permits the transverse mesocolon to separate from the gastrocolic omentum The stomach is drawn down and a finger is pushed through the avascular region in the

gastrohepatic omentum to the left of the right gastric artery
above the pylorus (Fig 186)   A gauze strip is then passed
posterior to the stomach and brought out through the rent in
the gastrocolic omentum, thus permitting the stomach to be
raised by traction on the gauze (insert)   The gastrocolic
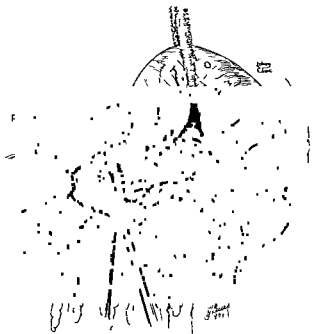omentum is then readily divided, ligating the gastro-epiploic

Fig 188—The pylorus and duodenum are separated from the pancreas and
all vessels are ligated as the mobilization progresses   A deeply penetrating pos-
terior ulcer may be opened into during the dissection of the ulcer from the
pancreas

vessels as they are clamped and divided   This procedure
should be accomplished cleanly, without hemorrhage, and with
the structures easily seen   The division is carried as far to the
left as necessary and then to the right toward the duodenum

As the mobilization proceeds toward the pylorus, great
care must be exercised to avoid injury to the middle colic

artery, which lies immediately adjacent and just posterior to the pyloric portion of the stomach The middle colic artery lies in the mesocolon which is somewhat adherent to the gastrocolic omentum at this point and, as the stomach is raised by the traction tape, the avascular tissues between these two structures can be readily seen and divided by sharp dissection, thus permitting the middle colic artery to fall posteriorly out of the line of dissection and allowing the right gastro epiploic vessels to be divided well beyond the pylorus (Fig 187)

Fig 189—Mobilization of the lesser curvature of the stomach and superior border of the duodenum The division and ligation of the right and left gastric arteries together with the vessels of the gastrohepatic omentum are illustrated

The pylorus and duodenum are next separated from the pancreas by blunt and sharp dissection (Fig 188) This may in many cases be difficult because of the inflammatory exudate and scar tissue In many cases the ulcer will have penetrated into the pancreas and the duodenum may be opened in the dissection This is not troublesome if effort is made to prevent gross soiling of the abdominal cavity The dissection is then continued until a relatively normal, pliable portion of the first

part of the duodenal tube is mobilized to allow safe inversion of the duodenum The superior border of the first part of the duodenum having been mobilized previously, the mobilization of the pylorus is completed by division and ligation of the right gastric artery and gastrohepatic omentum above the pylorus (Fig 189)
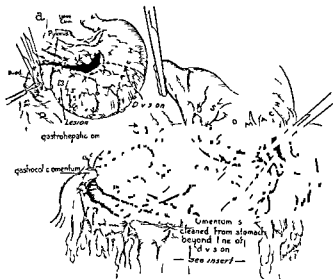

Fig 190—The duodenum has been divided and closed by inverting the mucosa The mobilized stomach is prepared for resection The omentum is detached on either border 4 or 5 cm above the point selected for transection of the stomach which permits safe inversion of the angles of the gastrojejunal anastomosis a Stomach and duodenum completely mobilized The duodenum is divided by cautery between clamps The level of resection of the stomach is illustrated by the dotted line

The pylorus and ulcerated duodenum having thus been freed from surrounding structures the division is made through the duodenum just distal to or even through the ulcer (Fig 190, a) This division is made by the actual cautery between Ochsner clamps thus permitting the stomach to be pulled well out of the field to the left side of the abdomen

The inversion and closure of the duodenum may be accom

plished by several methods We emphasize the importance of saving every possible bit of the duodenal tube and of not wast-
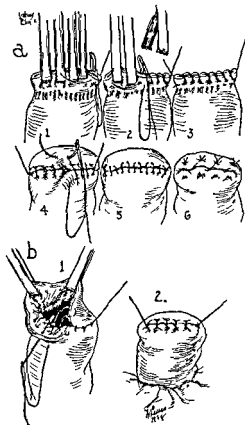

Fig 191—Two methods of closure of duodenal stump *a* The divided end of the duodenum is grasped with Allis forceps and the Ochsner clamp is removed Closure is completed by a continuous suture of catgut which is in verted by a second continuous catgut layer and reinforced by a third layer of interrupted mattress sutures of silk, *b*, The duodenum is opened widely by removal of Ochsner clamp and contents removed by suction The duodenal wall is inspected for other ulceration and closure obtained by Connell suture which is reinforced by a second layer of continuous catgut and by a third layer of interrupted silk sutures as in *a*

ing any of it by suturing over a clamp This may be accomplished by removal of the Ochsner clamp, thus opening the

duodenum widely, and then obtaining closure with an in and out Connell suture of catgut (Fig 191, b) This also permits examination of the duodenal mucosa for other ulcers and reveals the proximity of the opening of the common bile duct

A second method of closure that is frequently employed consists of grasping the divided end of the duodenum with Allis forceps, removing the Ochsner clamp and completing the closure with a continuous suture of catgut (Fig 191, a) This layer is inverted by a second continuous catgut layer and reinforced with interrupted mattress sutures of fine silk

Whichever method is employed, the final serosal layer consists of a layer of interrupted fine silk sutures The divided ends of the gastrocolic and gastrohepatic omentum are then sutured to the duodenal stump for reinforcement Frequently when the duodenal stump is shortened and difficulty is encountered in obtaining a safe closure, it may be reinforced by buttressing the stump against the head of the pancreas with sutures of silk

In a certain percentage of cases duodenal ulcers may be encountered which are so adherent and the infiltration so extensive that they can be removed only with great technical difficulty and with considerable risk to the patient If such a condition exists, or if the lesion involves the second part of the duodenum or the common bile duct safe inversion of the duodenal stump may be impossible even if the ulcer can be removed In such cases no attempt should be made to excise the ulcer but division should be made proximal to the pylorus, closing the pyloric stump and allowing the ulcer to remain in situ, after the method of Finsterer A high resection may then be carried out in the usual manner (Fig 192) We have performed this procedure in nineteen cases with excellent results It must be emphasized however that the method must

secretions

The duodenum has now been divided and the duodenal stump satisfactorily inverted The mobilization of the stomach is completed by pulling the stomach to the left and by dividing

the left gastric artery, which is doubly ligated with heavy silk
The left gastric artery, which is one of the branches of the
celiac passes posteriorly to the lesser omental cavity, upward,
and to the left to the lesser curvature of the stomach, reaching
the left border of the stomach near the cardia where it gives off
branches to the cardia and esophagus It then courses from
left to right along the lesser curvature to anastomose with the
right gastric artery If the stomach is pulled well to the left
and downward after division of the duodenum, the left gastric
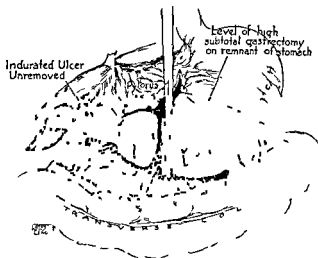
Fig 192 —High resection of stomach without removal of adherent duo-
denal ulcer Divis on may be made through the duodenum above the ulcer
or just proximal to the pylorus closing the duodenal or pyloric stump in the
usual manner

artery is readily exposed and may be divided and ligated as
high as necessary Occasionally the left gastric artery may be
ligated as a trunk near its origin off the celiac artery, particu-
larly if one is dealing with a high gastric ulcer or a malignant
lesion in which case it may be desirable to remove all glands
situated along the course of the artery

Great care is taken to divide the gastrocolic and gastro-
hepatic portions of the omentum on each border at least 4 or
5 cm above the point which is selected for transection of the

stomach (Fig 190) This dissection prepares the borders of the stomach wall for an easy and safe inversion of the angles of the gastrojejunal anastomosis These angles are the weakest points of the anastomosis, and ragged, fatty omental tags must not be interposed between the gastric and jejunal surfaces if leaks are to be avoided

The omentum has now been detached cleanly from the lesser and greater curvatures of the stomach and we are ready to proceed with the resection of the stomach The first loop of the jejunum is identified and the jejunum delivered from the abdomen, anterior to the transverse colon if anterior anastomosis has been decided upon This type of anastomosis has been used almost routinely in the past two years If for some reason it is decided to perform a retrocolic anastomosis, an incision is made in the transverse mesocolon and the jejunum is brought through this opening A generous loop of the jejunum is permitted to intervene, usually 8 to 12 inches, between the duodenojejunal flexure and the proximal part of the anastomosis Everything except the stomach and this portion of the jejunum is then returned to the abdominal cavity and carefully protected by waterproof laparotomy pads, these consist of several layers of gauze, between the layers of which has been stitched a piece of waterproof cellophane Every effort is made to prevent contamination of the abdominal cavity and, at the same time avoidance of unnecessary exposure of the viscera prevents loss of heat and moisture which materially reduces opportunity for shock

We have employed the von Petz sewing clamp in practically all of our resections and have found it to be of great value It prevents soiling, facilitates closure of the stomach saves time, effectually controls hemorrhage and reduces the technical difficulties measurably The line of resection is decided upon, removing at least three fourths or four fifths of the stomach (Fig 190) The stomach is then raised by the assistant and the von Petz clamp is applied across the mobilized

curvatu c   \`\ 8
curvature is just above the re entrant angle of the stomach and slightly lower on the greater curvature After the clips have

been inserted by the von Petz clamp, the clamp is removed, leaving the double row of clips firmly in place

The division of the stomach is then completed by cautery between the double row of clips, the line of division being carried very close to the distal row of clips, which may be reinforced by a Payr clamp placed just distal to the distal row to prevent the clips from slipping and allowing spilling
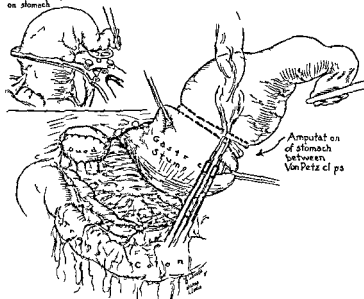

Fig 193—The von Petz clamp is applied across the mobilized stomach at a point selected for the line of resection (insert) The stomach is divided by actual cautery between a double row of clips which are inserted by the von Petz clamp

from the resected end of the stomach This maneuver leaves a cuff of crushed stomach tissue on the proximal end of the resected end of the stomach sufficient to prevent the clips from pulling out and no other clamp is needed on the remaining part of the *stomach These clips effectually prevent spilling and bleeding from the transected end of the stomach*

The Hofmeister method of anastomosis is then followed

stomach (Fig 190) This dissection prepares the borders of the stomach wall for an easy and safe inversion of the angles of the gastrojejunal anastomosis These angles are the weakest points of the anastomosis and ragged fatty omental tags must not be interposed between the gastric and jejunal surfaces if leaks are to be avoided

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We have employed the von Petz sewing clamp in practically all of our resections and have found it to be of great value It prevents soiling facilitates closure of the stomach saves time effectually controls hemorrhage and reduces the technical difficulties measurably The line of resection is decided upon removing at least three fourths or four fifths of the stomach (Fig 190) The stomach is then raised by the assistant and the von Petz clamp is applied across the mobilized stomach somewhat obliquely from the lesser curvature near the cardia and slightly downward and to the left on the greater curvature (Fig 193) The point of division on the lesser curvature is just above the re entrant angle of the stomach and slightly lower on the greater curvature After the clips have

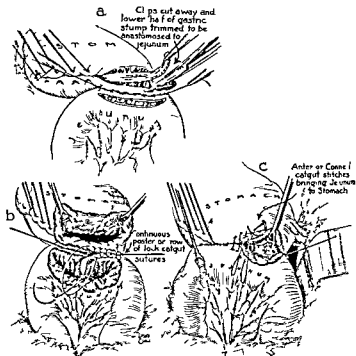into the side of the jejunum to form the gastrojejunal stoma
(Fig 194)

The jejunum which has been brought anterior to the transverse colon is then sutured to the end of the stomach It makes little difference whether the proximal jejunal loop is placed at the greater curvature or at the lesser curvature of the stomach We have obtained satisfactory emptying of the stomach by either method No clamps whatever are used in completing the anastomosis

For more than two years we have employed an antecolic anastomosis in the majority of our cases of subtotal resection of the stomach Postoperative obstruction has not developed in any case, and it is our opinion that there is less opportunity for obstruction with this type of anastomosis because, in some instances the obstruction occurred in the distal jejunal loop and was caused by induration and inflammatory changes in the mesocolon at the point of anastomosis Entero enterostomy between the afferent and efferent loops has not been done, on the contrary, such an anastomosis is contraindicated because it is highly desirable that the alkaline duodenal contents bathe the gastrojejunal stoma rather than be sidetracked by entero-enterostomy

Occasionally it will be necessary to make the gastro jejunostomy transmesocolic because of the presence of a short mesentery to the jejunum or because of a heavy dependent omentum A posterior row of interrupted silk sutures (No 11) is used to unite the jejunum to the uninverted portion of the divided end of the stomach An incision is then made in the jejunum corresponding in length to the size of the stoma in the stomach, which is indicated by the clips which have not been inverted by suture The stomach is opened by cutting away the remaining uninverted clips, the incision starting at the greater curvature and an aspirator being inserted through a small opening to evacuate any fluid remaining in the stomach (Fig 194)

The opening of the stomach is then completed and all bleeding vessels on the anterior wall of the stomach are ligated with fine catgut The bleeding points on the posterior wall of the stomach are controlled by the posterior suture layer The posterior anastomotic row is then completed by a second suture

The remaining part of the stomach is elevated by tacking forceps applied just proximal to the row of clips The upper portion of the resected end of the stomach is inverted with clips in place and a double row of chromic catgut (No 00

a. Clips cut away and lower half of gastric stump trimmed to be anastomosed to jejunum

b. Continuous posterior row of lock catgut sutures

c. Anter or Connell catgut stitches bringing Jejunum to Stomach

posterior anastomosis is completed by a second suture line of continuous inter locking catgut c Catgut suture continued onto anterior row as a Connell in and-out suture closing the anastomosis

atraumatic needle) sutures is inserted reinforced with inter rupted mattress sutures of black silk (No 11) A sufficient portion of the lower part of the transected end of the stomach at the greater curvature is not inverted and is used to suture

195) With the completion of the anastomosis (Fig 196),
the abdominal cavity is inspected for bleeding points and then
closed without drainage We employ drainage only in the
occasional case of a perforating ulcer of the duodenum which
has penetrated deeply into the pancreas, leaving a dirty, in
fected base where the duodenum is removed

The abdominal incision may be closed by the usual layer
sutures of catgut or by means of through and through sutures
of heavy black silk Formerly these sutures included all layers
but, more recently, we have sutured the peritoneum with con-
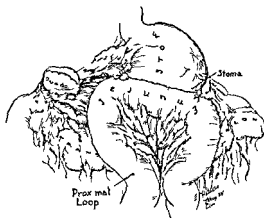
Fig 196—Completed operation employing Hofmeister method of gastro
jejunostomy The relative size and position of the gastrojejunal stoma are
shown by the dotted outline The jejunum has been brought anterior to the
colon Note that entero anastomosis is not done

tinuous catgut stitches and then closed the remaining layers
with heavy silk, which includes all layers save the peritoneum
and the posterior rectus sheath These silk sutures are placed
fairly close together and close to the edges of the wound and
are not tied too tightly in order to prevent necrosis We have
found this method to decrease greatly the time of closure of
the abdominal wound and to prevent postoperative disruption
of the wound The skin edges may be further approximated
by fine black silk sutures if necessary

We regularly administer a blood transfusion immediately

line of continuous interlocking catgut stitches (Fig 194)
This catgut suture is continued onto the anterior row as a
Connell in and out suture thus inverting the mucosa of the
stomach and jejunum satisfactorily and closing the anastomosis
The anastomosis is further reinforced by a second anterior row
of interrupted mattress sutures of silk   The gastrojejunal
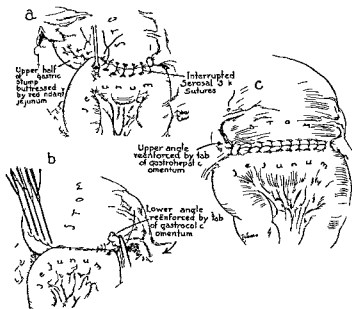
Fig 195—a Gastrojejunal anastomosis completed by reinforcing anterior
suture line b a second anterior or row of interrupted mattress sutures of silk
The jejunum is buttressed by interrupted silk sutures against the inverted
upper half of the divided end of the stomach b Angles of anastomosis reinforced by suturing the divided gastrocolic and gastrohepatic omentum onto
them c Completed anastomosis

stoma should be large enough to permit insertion of three
fingers readily   The jejunum is then buttressed by interrupted
silk sutures against the previously inverted upper half of the
divided end of the stomach   Attention is paid to the angles
which are reinforced with silk sutures and by suturing the
divided gastrocolic and gastrohepatic omentum onto them (Fig

a radical procedure was employed only in removing carcinoma of the stomach or lesions suspected of being malignant

Subtotal gastrectomy is an extensive technical procedure, but it can be utilized safely and with a low mortality in the hands of surgeons with experience in gastric surgery

The method of resection of the stomach as employed at the Lahey Clinic is illustrated and described in detail

after operation, even though there is practically no blood loss and shock is rarely seen We believe that transfusion is of great benefit because of the magnitude of the operative procedure and because many of the patients selected for subtotal gastrectomy are in poor general condition A Levine nasal tube is introduced into the stomach and allowed to remain there until it can be demonstrated that the stomach is draining satisfactorily and peristalsis has again become normal Feeding by mouth is begun after thirty six to forty eight hours by giving hourly small quantities of water, if tolerated, milk or malted milk is given in gradually increasing amounts To this are added other types of food so that, by the time the patient is allowed out of bed, the diet, although restricted, is quite sufficient for fluid and caloric requirements

The problem of anesthesia is of considerable importance in gastric surgery The desirable features to be sought after in this type of surgery are utmost relaxation and a large margin of safety Spinal anesthesia produces the most satisfactory relaxation and permits ready exposure of the stomach without constant retraction and its accompanying trauma For more than two years we have used nupercaine in a 1 1500 dilution as proposed by Mr Howard Jones and modified by Dr P D Woodbridge of our anesthetic division We have found this dilute nupercaine solution to be quite satisfactory as a spinal anesthetic It produces a prolonged period of anesthesia without serious drops in blood pressure Furthermore should sensory function return before completion of the operative procedure, the motor activity continues to be abolished over much longer periods than with other anesthetic agents The addition of cyclopropane inhalation anesthesia will be sufficient to continue the operation

We have not found it necessary to employ splanchnic infiltration which was necessary with other types of anesthesia to obtain the necessary degree of relaxation and to prevent the fall of blood pressure so likely to occur from traction on the stomach

Summary—Subtotal gastrectomy or partial removal of the stomach is an accepted method of surgical management of benign ulcers of the stomach and duodenum Formerly such

A NEW TYPE OF ILEOSTOMY FOR CHRONIC ULCERATIVE COLITIS

Richard B. Cattell

Ileostomy becomes an unfortunate necessity in cases of chronic ulcerative colitis which has become intractable to medical management or when serious complications of the disease are present   It rarely can be done at a time of election, and for that reason it is frequently performed at a time when these patients are decidedly poor risks   Because of the tendency to delay operation in these cases and to carry it out only as a "last resort," the operative mortality has been high In this clinic, surgical consultations are sought early in our complicated cases by our gastro enterological service, yet the mortality of ileostomy in our hands is 22 per cent

In our experience ileostomy has been permanent with two exceptions   It must be admitted that complications due to the presence of an ileostomy have been somewhat frequent There is a tendency for the ileum to prolapse because of the mobility of the ileal mesentery   One patient had recession of the ileostomy so that it became separated from the wall and became free in the abdominal cavity   Stricture in the abdominal wall causing obstruction of the ileum has been observed   One patient had prolapse of the ileostomy into the abdominal wall leading to gangrene   A large portion of ileum became inter stitial in this case   Two patients required subsequent resection of some of the projecting ileum   Fortunately none of these complications resulted fatally   Two patients developed sec ondary openings proximal to the stoma of the ileum, one lead ing to a fatal generalized peritonitis   When one adds these complications and the mortality associated with the procedure to the difficulty of management of an ileostomy because of the irritating liquid discharge, one is impressed with the impor tance of performing a satisfactory ileostomy

TECHNIC OF ILEOSTOMY

A short, right rectus incision is made, splitting the junction of the middle and inner thirds of the muscle, the upper end of the incision reaches the level of the umbilicus The peritoneum is opened, lifted up, and the right lower quadrant of the abdomen is inspected   No exploration whatever is carried out since handling or palpation of the colon may result in dissemination of the infection throughout the abdomen   The distal ileum is lifted up and the ileocecal region identified   This area of ileum is carefully inspected, since approximately

Fig 197—*a* The ileum has been divided between clamps Division of the mesentery permits greater withdrawal of the proximal loop This type of ileostomy is done when patients are poor risks *b* both loops are brought out through the incision staggering the proximal loop for immediate decompression

20 per cent of these cases show involvement of the terminal ileum in the inflammatory process (Fig 197, *a*) The selection of the site for ileostomy is based on the condition of the ileum and is usually chosen at a point 4 to 8 inches from the ileocecal valve The peritoneum of the ileomesentery is divided vertically on each side so that the vessels can be isolated (Fig 198, *a*) Two or three of the arching vessels are divided to permit good mobility Care is taken to see that the ileocecal artery is left intact If the patient is in poor condition, the ileum is divided between clamps (Fig 197, *a*), the mesentery is anchored to the anterior parietal peritoneum, and the loops

From our experience with the more serious cases of ulcera
tive colitis ileostomy has been considered to be the first step
toward subsequent subtotal or total colectomy

An ileostomy should satisfy the following criteria It should
be in a position on the abdominal wall to make its care as easy
as possible, and it should not be conspicuous The site of the
ileostomy should be such that the later incision for colectomy
will not be interfered with The ileum should be firmly fixed
in the abdominal wall so that it will neither prolapse nor with
draw The position of the ileal loop coming up to the ileostomy
should be so placed that obstruction of small intestinal loops
will not occur Finally, the functioning loop of ileum should
project sufficiently so that the liquid fecal discharge is not de
livered directly on the skin surface

The types of ileostomy are similar to the types of colos
tomy A simple loop may be withdrawn in a manner similar to
the technic described for loop colostomy (see page 649) This
type of ileostomy is selected for patients who are in a critical
condition since the operation presents the least technical
difficulties

The end or single barreled ileostomy is perhaps the most
satisfactory method and it is utilized for the better risk pa
tients and particularly for those in whom colectomy will un
questionably be required This may be done by the technic
suggested by Rankin although the technic which will be de
scribed here we believe offers definite advantages Rankin
suggested inverting the distal end and dropping it back into

as possible but it has one important disadvantage Due to
the involvement of the colon structure formation may result
particularly after diversion of the fecal stream which may
cause sufficient back pressure to open the ileum or lead to
perforation of the colon

A new type of ileostomy will be described which implants
the proximal and distal loops in separate incisions the distal
nonfunctioning ileum being in the line of incision for the sub
sequent colectomy

clamp is passed to grasp the distal ileum (Fig 198, b) A clamp is then applied through the original incision beside it on the proximal ileum, and the bowel is divided with the cautery The distal loop is then withdrawn through the stab incision and gauze is wrapped about it (Fig 198, c) No further anchorage of the distal loop is necessary as it will be held there by the clamp by the gauze, and by its adherence to the abdominal wall

The proximal or functioning ileal loop is now elevated and the ileomesentery anchored with interrupted sutures to the under side of the anterior peritoneum (Fig 198, c) The peritoneum of the incision is then closed snugly about the projecting ileum and the edge of the mesentery next to the bowel is then anchored to the peritoneum on each side No sutures are taken anchoring the ileum itself to the peritoneum since we have found that a fistula may be created by such sutures even though only serous and muscular coats are included in the sutures

The layers of the wall are then closed about the ileum, leaving the fascial layer quite loose Dry gauze is placed about the ileostomy This should project for 1½ to 2 inches (Fig 199 a) A large catheter is then placed in the ileum and anchored there with a purse string suture after removal of the clamp In order to have the ileum project straight out from the abdominal wall, a further portion of the ileomesentery must be severed Thus one half of the projecting ileum loses its viability but maintains the continuity for forty eight hours This immediate decompression of the ileum is an essential part of either the loop or end ileostomy (Fig 199, b)

After forty-eight hours the discharge from the ileum be comes too thick to pass through the catheter If this drainage is unsatisfactory during this short initial period, it is usually because the tube did not pass below the abdominal wall At the end of this period, the tube is removed, a finger is intro duced into the ileum, and a suction tube is introduced into the ileostomy We employ the suction tube described by Dr Rolf Lium in the New England Journal of Medicine This has proved a very efficient means of keeping the wound dry for a number of days After seven days the ileum discharges into the dressing

are withdrawn so that the proximal one projects for 1½ inches, leaving the distal one at the level of the skin (Fig 197, *b*).

The divided type of ileostomy which we prefer to employ is similar up to the point of application of the clamps to the
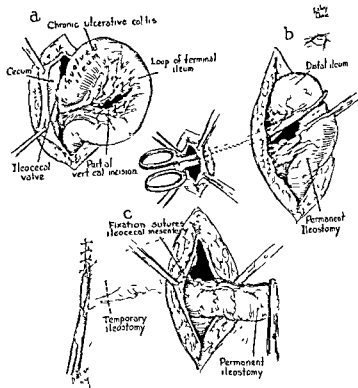
Fig 198 —*a*, Showing terminal ileum involved by ulcerative colitis The mesentery is divided vertically, *b*, curved clamps are passed through the stab incision to grasp the distal ileum and *c*, implantation of distal loop The mesentery of the proximal loop is anchored to the anterior wall peritoneum to prevent later prolapse

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For the first few days the wound can be protected by the application of tincture of benzoin Following this kaolin aluminum or bronze paint or powder provides satisfactory protection Dressings should be changed frequently

When the wound is firmly healed, the patient is fitted with an ileostomy bag If the loop projects sufficiently, the discharge will pass directly into the bag without much soiling of the abdominal skin There is of course more or less constant irritation to the skin around the ileal stoma, and at this stage it is perhaps best protected with a generous application of Fuller's earth It will probably be impossible to avoid
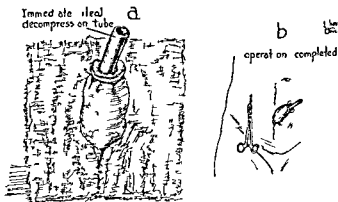
Fig 199—a Immediate decompression of proximal loop after application of wound dressing b state of loop in completed operation The lateral one will be removed at the time of colectomy

some degree of skin irritation for the first few weeks after ileostomy We have observed a definite change in the character of the ileal discharge following complete colectomy, which indicates that the ileum is capable of taking over much of the fluid absorptive function that the colon normally carries out When this takes place, there is no further difficulty in the care of the skin

The technic of ileostomy which has been described has definitely reduced the late complications incident to its procedure If a satisfactory management of the ileostomy is begun immediately after operation and carried out as de-

scribed, a maximal amount of comfort for the patient will be provided

Twenty four patients have been submitted to complete colectomy following ileostomy Twenty one of these patients are living and most of them manage their ileostomy quite satisfactorily The longest period of observation of a patient with an ileostomy has been ten years, the patient pursues a normal activity and is exceptionally well

Observations on these patients have conclusively demon strated that a correctly performed ileostomy is consistent with reasonable activity and good health

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MIKULICZ RESECTION FOR CARCINOMA
OF THE COLON

FRANK H. LAHEY

WHEN one discusses any type of so called Mikulicz resection of the intestine, it should be immediately made clear that this does not mean the original type of Mikulicz, first described by Paul in England and later by Mikulicz The original Mikulicz resection consisted of implantation of the segment of bowel containing the malignant lesion into the wound with the mesentery unremoved, or removed at best for only a short distance

This original type of Mikulicz procedure had relatively little value except that of security The drawbacks to it were that, because the colon was not mobilized, the malignant lesion was often implanted directly in the abdominal incision, thus resulting in transplant of malignancy into the wound It was likewise open to the objection that because the mesentery was not liberated and removed, only limited segments of the intestine could be removed, and its greatest objection was the fact that with the removal of the segment of bowel containing the malignant lesion, no large segment of gland containing mesentery was removed with it

I and numerous others have so modified the Mikulicz procedure that all of these objections are now overcome but the original feature of security is still retained

By incising the parietal peritoneum just outside the portion of colon to be removed in the ascending or descending colon or sigmoid, or by ligating the gastrocolic omentum in the transverse colon, by freeing the lateral fold of peritoneum outside the colon and hepatic flexure and likewise at the splenic flexure, the entire colon can of course be so mobilized that it hangs by its mesentery and its mesentery-contained blood supply As is shown particularly in Fig 200, representing the

removal of the entire right colon and hepatic flexure, just as large segments of mesentery and its contained glands can be removed by this modified procedure as can be removed by any method of excision involving preliminary lateral anastomosis or primary removal of the segment of colon containing the malignant lesion and primary anastomosis
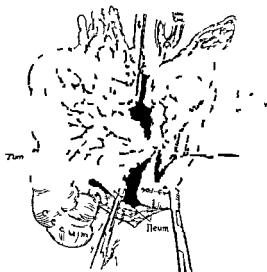

Fig 200—The parietal peritoneum outside of the ascending colon has been mobilized the mesentery of the ascending colon and hepatic flexure has been ligated and is being severed down to its root and Ochsner clamps have been applied to the terminal ileum and to the transverse colon to the right of the middle colic artery   The ends have been severed with the cautery and that portion of the bowel grasped within the Ochsner clamps has been thoroughly sterilized   It will be seen that the entire right colon hepatic flexure and right half of the transverse colon together with the terminal ileum and the mesentery of this segment of bowel can be radically removed

We have now done over 200 removals by this modified Mikulicz plan of malignant lesions of the colon in all locations from the ileum to below the sigmoid and we are quite con

just as high a percentage of nonrecurrence of carcinoma as after primary removal and primary suture. 2. The resulting
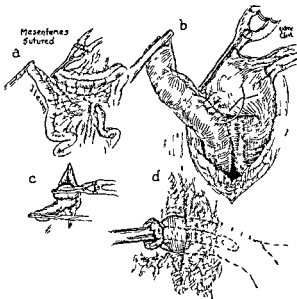
Fig 201—a, Showing suture of the "V" in the mesentery to repair the defect made by the removal of the mesentery of the removed segment of bowel (Note the principle of staggering shown in a, b and c, which I described in my original article on our plan of modification of the Mikulicz procedure applied to the right colon) Note also in b that approximately 4 inches of the terminal ileum has been devascularized, and that in this case the ileum is shown sutured to the transverse colon to establish the double-barreled Mikulicz plan In c, the wound is closed about the double-barreled loop of transverse colon and terminal ileum Note here also the 4 inches of devascularized bowel into which, as is shown in d, a large catheter is inserted to produce immediate decompression In this step the other end of the Mikulicz double barreled loop is covered with gauze This is the staggering principle which I devised by which it is possible to resect and decompress at the same time It will be seen in b that the entire blood supply of the 4 inches of terminal ileum has been ligated at the end of four to five days this portion of ileum will slough off so that the two ends of ileum and transverse colon will be even

enterostomy, which remains after the spur between the two loops of bowel, can be successfully closed in every case by an extraperitoneal procedure of minor importance. There have

removal of the entire right colon and hepatic flexure just as
large segments of mesentery and its contained glands can be
removed by this modified procedure as can be removed by any
method of excision involving preliminary lateral anastomosis
or primary removal of the segment of colon containing the
malignant lesion and primary anastomosis

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mobilized the mesentery of the ascending colon and hepatic flexure has been

entery of this segment of bowel can be radically removed

We have now done over 200 removals by this modified

plan to the mobilized section of the splenic flexure This gives good wound implantation for the Mikulicz principle of double barreled loops of bowel and permits radical removal of the gland bearing area plus that segment of the colon involved

In lesions of the right colon and hepatic flexure, one should bear in mind that when the parietal peritoneum of the right colon is incised and the colon wiped inward so that it hangs by its mesentery, the ureter will be found to be adherent to the mesentery, particularly where it crosses just above the pelvic brim It will, therefore, be necessary in all cases of resection of, particularly, the right colon to identify and dem onstrate the ureter throughout its upper course

It will likewise be necessary in resections of the hepatic flexure to demonstrate the retroperitoneal duodenum, and to dissect it carefully from the posterior aspect of the mesentery of the hepatic flexure in order that, with removal of a deep segment of mesentery of the ascending colon and hepatic flexure, the retroperitoneal duodenum is not injured The retroperitoneal duodenum may be mobilized freely and without hesitation Its blood supply comes from the middle line and with a large experience now with mobilization of this structure no difficulty whatever with blood supply has been encountered

In resections of the splenic flexure one must be careful in removing the mesentery lest too radical removal take one down to the point where the jejunum becomes retroperitoneal One must be careful also to leave an apron of mesenteric peritoneum about the jejunal fossa (Fig 202, c) The per itoneum here is extremely viable and, if the dissection is carried down to the point where the jejunum becomes retro peritoneal it will be almost impossible to reconstruct with security this peritoneal covering about the point where the jejunum becomes retroperitoneal It is very much better to leave 3 or 4 inches of mesenteric peritoneum around the open ing in the jejunal fossa in order to avoid this danger

In mobilizations of the sigmoid for the resection of malig nant lesions on the Mikulicz plan it is extremely important to see that not only all the outer leaf of peritoneum of the sigmoid is severed but that this fraying of the outer leaf of parietal peritoneum is carried well down below the pelvic brim and well up to the splenic flexure This produces complete

been no cases in which secondary closure of the enterostomy
has failed   3 The mortality of this operation in our hands
is less than that of primary resection and primary anastomosis
The procedure can be applied when the principle of staggering
(Fig 201, b) is employed, in patients with moderate degrees of obstruction, since immediate decompression of the intestine can be instituted

The drawbacks of the procedure are primarily that for two months the patients must put up with an enterostomy, during which time most of the fecal stream is discharged by way of the abdominal wall, and not infrequently there is present considerable irritation of the skin about the enterostomy   It can safely be said from our experience, however, that the closure of the enterostomy at the second stage, two months after the patient has left the hospital following the first stage, can be instituted no matter how irritated or moist the skin may be   This skin irritation is largely a matter of chemical irritation and, as soon as the enterostomy is turned in extraperitoneally, it will immediately clear up

There are certain things which we have learned as a result of this experience in the general application of the Mikulicz procedure to malignant lesions of the colon   One should not attempt radical Mikulicz procedures on patients with any marked degree of obstruction without first instituting a preliminary decompression Mikulicz procedures can be applied ~~of moderate ob~~

of the midtransverse colon and implant the two ends of the transverse colon in the median line   Median abdominal incisions as is shown so well in postoperative upper abdominal ventral hernias, tend to separate and with this herniation spoil the principle of abdominal wall implantation of the two remaining loops of bowel after the colon has been resected   If one wishes to resect a lesion of the midtransverse colon it is much better to take with it all of the ascending colon all of the hepatic flexure and the involved portion of the transverse colon, mobilizing the splenic flexure and approximating the terminal ileum through *a left rectus incision and a Mikulicz*

An extremely important point in the management of Mikulicz procedures is that, when the segment of involved bowel is removed and the two ends are implanted in the wound after their two limbs have been sutured together (as shown in Fig 203, c), one should be certain that at least 2 inches of bowel in either loop is implanted well above the level of the skin
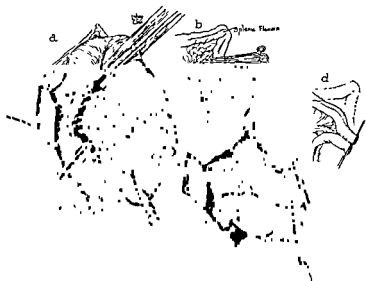
Fig 203—Application of the modified Mikulicz principle to lesions of the sigmoid flexure a, Two Ochsner clamps are applied above and below the segment of intestine to be removed, and a "V" of mesentery is ligated and severed In b, one may see diagrammatically the segment of bowel to be removed In c one may see the defect in the mesentery sutured and the approximation of the double barrel loop, and in d, the method of mobilizing the splenic flexure in order to bring down and unfold that portion of the colon to obtain an adequate upper loop for the establishment of the Mikulicz enterostomy for low sigmoidal lesions

In implanting the double-barrel loop of large intestine or transverse colon and ileum in the skin, no sutures should be taken between the bowel wall of the colon or ileum and the parietal peritoneum If such sutures are taken, one can never be sure that they do not penetrate into the lumen of the colon and that, with coughing and vomiting postoperatively, they

mobilization of the bowel   In certain instances it will even
be necessary to cut the external attachment of the splenic
flexure to the diaphragmatic region   When this is done the
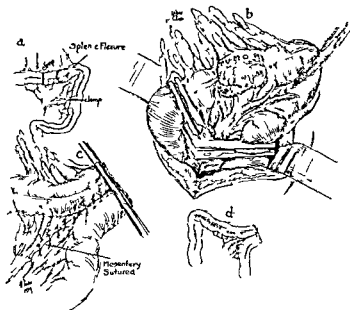
Fig 202—a Shows diagrammatically the segment of bowel to be removed
in carcinoma of the splenic flexure Note from the dotted lines that the mes
entery involved swings across the angle of the mesentery of the splenic flexure
but does not descend to the edge of the jejunum where it becomes retro
peritoneal This is the apron of peritoneum referred to which it is necessary

the approximation of the two loops of colon implanted through the high left
rectus incision d Shows the mobilized and depressed transverse colon (in
dotted lines) and the point where the splenic flexure was before mobilization
of this structure

sigmoid can thus be freely mobilized and wide margins beyond
the malignancy, together with a wide apron of peritoneum
can be removed

in such cases, when the upper and proximal loop of bowel is distended to introduce a purse string suture proximal to the obstructing Ochsner clamp (Fig 200), to puncture the bowel and introduce a catheter and thus accomplish relief of gaseous distention in many cases without having to take the clamp off and produce soiling of the wound If, however, it is desirable to accomplish immediate relief of obstruction with the wound covered with sterile vaseline and protected with gauze, it is possible to remove the clamp from the proximal portion of bowel after twelve to twenty-four hours

As soon as these patients are in good condition and have recovered completely from the immediate effect of the operative procedure, their temperature being normal and the distention, if present, eliminated, an Ochsner clamp or any other form of clamp one desires may be introduced with one jaw in each loop and closed to cut down the spur and begin the establishment of the fecal stream In our experience it has been better to accomplish this spur cutting by one or two bites of the clamp rather than by attempting with a long-jawed clamp to cut too much of the spur at one time

We have arbitrarily set a period of two months after the patient has left the hospital following the first operative procedure as the desirable time at which to make the secondary closure of the remaining enterostomy We have on occasion attempted secondary closure of such enterostomies at an earlier date because it was more convenient for the patient, closure can undoubtedly be accomplished earlier than this, but not with the ease and satisfaction with which it can be done two months after the patient leaves the hospital after the first stage At the end of two months the parietal peritoneum is firmly adherent to the implanted bowel, the edema has largely gone out of the wound, and satisfactory freeing and inversion of the implanted bowel can be accomplished better at this date than at an earlier one

In secondary closure of the remaining enterostomies after Mikulicz removals, we have demonstrated in some individuals that it is not necessary to separate the bowel from fascia and muscle down to the peritoneum We have in some cases separated the implanted loop only from the skin and fat down to the fascia and inverted it carefully at this point beneath

will not tear out and produce fecal contamination of the wound
or fatal peritonitis With the double barreled loop of colon or
colon and ileum implanted in the wound, it is sufficient to
suture the separate layers of the abdominal wall with moderate
snugness about the two loops of implanted bowel One must
be extremely careful that this approximation of parietal per
itoneum about the two loops of bowel is not sufficiently tight
to produce intestinal obstruction, on the other hand however
it must be sufficiently tight so that loops of small intestine will
not crowd themselves out between the bowel wall and the
parietal peritoneum and thus produce obstruction If the
parietal peritoneum is sutured about the double barreled loops
of intestine with sufficient snugness so that one's little finger
can be readily inserted into the peritoneal cavity, this will
usually suffice

Following the performance of any enterostomy, either of
the Mikulicz type or of colostomy, and particularly end
colostomy, for the radical removal of carcinoma of the rectum
one should take great pains to inspect the loops of implanted
bowel within twenty four hours to ascertain whether or not
they possess an adequate blood supply There will sometimes
be instances when this segment of bowel is inspected at the end
of twenty four hours when it will be evident that one loop of
bowel will not have an adequate blood supply, necessitating the
mobilization and pulling out of a sufficient amount of colon
that does have an adequate blood supply This has never
occurred in our experience with a Mikulicz type of double
barrel bowel implantation in the abdominal wall but it has
occurred with end colostomies making us cautious of ascertain
ing in every case within twenty four hours that the implanted
loops of bowel are viable

When the right colon is resected (Fig 200) immediate
decompression of the ileum may be accomplished by the intro
duction of a catheter or a Paul tube into the bowel When,
however, the sigmoid is resected without the so-called stag
gering of the loops, the problem will not infrequently arise
concerning how soon the clamps on the proximal portion of
bowel may be removed in order to relieve the cramping pain
which occasionally occurs on the following day or day after
because of the complete intestinal obstruction It is possible

in such cases, when the upper and proximal loop of bowel is distended to introduce a purse string suture proximal to the obstructing Ochsner clamp (Fig 200), to puncture the bowel and introduce a catheter and thus accomplish relief of gaseous distention in many cases without having to take the clamp off and produce soiling of the wound If, however, it is desirable to accomplish immediate relief of obstruction with the wound covered with sterile vaseline and protected with gauze, it is possible to remove the clamp from the proximal portion of bowel after twelve to twenty-four hours

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the skin with as complete satisfaction as when fascia and muscle were separated and the bowel turned in and these two structures sutured over the implanted bowel

Many visitors who have employed the Mikulicz procedure have complained to us that they have had difficulty in invert ing the segment of bowel implanted in the abdominal wall This is, we feel certain, due to the fact that they have not adequately removed all of the indurated epiploic appendages and all of the indurated mesentery attached to the bowel If one is to accomplish satisfactory inversion of the tube of bowel implanted in the abdominal wall, then every bit of indurated fat on the bowel must be so removed that the segment of bowel to be turned in is as soft and flexible as an uninflamed and uninvolved segment of intestine within the abdominal wall When such removal is accomplished, the bowel can be accurately and satisfactorily inverted with two or three layers and will then remain inverted When one attempts to invert a bowel wall containing indurated fat and indurated mesentery it must be forcibly inverted and held inverted by sutures This will hold the inversion only long enough for the sutures to be absorbed when it will open and will then reestablish a fecal fistula that may be more difficult to close

Many of the visitors who come to the clinic ask whether or not we are in favor of such low implantation of the ends of bowel within the abdominal wall that when the spur

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or straining of retraction of this open end of the bowel into the abdominal cavity We much prefer to implant the ends of bowel at least 2 inches above the level of this skin under taking designedly such an enterostomy that will require a secondary procedure This has given us as already stated complete satisfaction and has resulted in complete closure of the enterostomy in every case in which it has been undertaken

No attempt should be made to close the enterostomy which follows the original Mikulicz procedure on the patient s return

to the hospital two months after the primary operation until one is certain that the spur has been adequately cut down Not infrequently when patients return at the end of two months a spur which seemed to have been well cut down during the first stay in the hospital will have so contracted that the septum will not prove to be adequately divided at this time Further application of the clamp will then be necessary to be certain that the spur is adequately severed If the spur between the two loops of bowel is not adequately severed and the ends of the enterostomy in the abdominal wall turned in this will result in some degree of intestinal obstruction

The above are a few of the things which we have learned from our experience with these operations which may prove useful to those who plan to employ them Figures 200-203 quite adequately explain the principles of the modified Mikulicz procedure

Conclusions —The modified Mikulicz procedure may be applied to malignant lesions at any level of the colon from the terminal ileum to the lower sigmoid Just as radical removals of bowel and mesentery may be accomplished by this procedure as may be accomplished by any of the other procedures associated with primary anastomosis The modified Mikulicz plan of procedure has in our hands practically eliminated the occasional unexpected death which results from leakage or intestinal obstruction with the primary resection methods of removal Finally no removal of carcinoma of the large intestine with immediate primary suture has been undertaken in this clinic now for over ten years

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LOOP COLOSTOMY

Richard B. Cattell

Loop colostomy is usually performed for the relief of obstruction or impending obstruction due to carcinoma of the rectosigmoid or rectum It may be the only procedure, as for inoperable malignancy in this portion of the large bowel, or it may be a first stage procedure followed by perineal or posterior resection of the rectum In a few instances it serves to decompress the colon, following which resection and anastomosis are performed distal to the site of the colostomy It may be necessary also for the relief of obstruction from other, nonmalignant conditions such as diverticulitis, lympho granuloma ulcerative colitis or endometriosis

The site usually selected for the colostomy is in the redundant sigmoid colon since this will be well above the point of obstruction At times it is necessary to bring out a loop of descending colon transverse colon, or even ascending colon The latter sites lead to more technical difficulties and result in less satisfactory control of the fecal discharge

Most loop colostomies are permanent since the underlying condition for which they are done usually necessitates removal of distal segments of the bowel or destroys the lumen in the area involved Because of the permanence of many of the colostomies it is quite important to construct the opening in such a way that permanent satisfactory function is insured Technical steps should be followed, devised to make the care of the artificial anus as easy as possible

There are a few general principles that have proved of value in the performance of colostomies The projecting loop should come well above the skin level so that, after division, the proximal loop will emerge for at least 1 inch This will tend to prevent later stricture of the opening The proximal loop should be brought out directly, without any attempt to leave a reservoir of bowel within the abdomen Tension must

be avoided or there will be gradual retraction of the loop into the wound   Both loops should be brought out together in order that a small dressing will cover them   There is no method with which we are familiar which provides any sphincteric action and we believe it advisable to bring the colostomy directly through the wound   The emergence of the colon naturally weakens the abdominal wall and it is not uncommon to have a general bulge or hernia in this area   The colostomy should be placed in as inconspicuous a position of the abdomen as possible and should not project so far as to appear bulky   General abdominal support with a belt helps to protect this area

Spinal anesthesia is routinely used for the performance of colostomy   The technic which we use requires good relaxation and spinal anesthesia certainly provides the best operating conditions possible   Pontocaine (heavy) is now regularly used as the anesthetic

Since the usual position for colostomy is in the sigmoid
                                                                    will
                                                                    in
                                                                    uter
thirds   This extends about an equal distance above and below the umbilicus   Usually only one intercostal nerve is divided and the deep epigastric artery is preserved   This incision permits satisfactory abdominal exploration and does not weaken the abdominal wall unduly   We do not believe that lower midline or umbilical colostomies are satisfactory   Likewise, small muscle splitting incisions near the left iliac crest do not permit satisfactory exploration and frequently lead to difficulty in delivery of sufficient sigmoid to form a satisfactory colostomy

Following abdominal exploration the sigmoid colon is lifted up and the peritoneal reflection passing from the lateral parietal wall onto the mesosigmoid is divided   The incision in the peritoneum is made close to the sigmoid   leaving a small

drawing the mesosigmoid toward the median line

With the sigmoidal loop sufficiently freed, the left colic and sigmoidal vessels can be visualized or palpated. With the position of these vessels determined, vertical incisions in the mesosigmoidal peritoneum are made, exposing the anastomotic branches between the left colic and upper sigmoid arteries. Two or more of these are divided, but the marginal vessel next to the sigmoid is kept intact (Fig 204, c), since the latter ves-
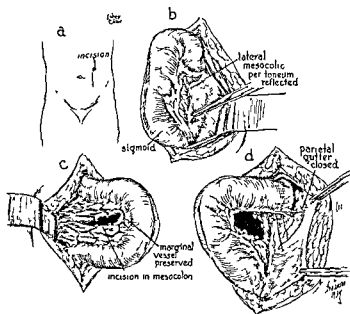
Fig 204—a Position of incision It can be extended in either direction for any operation on the left colon or rectum b, Loop of sigmoid elevated The parietal peritoneal attachment is severed c, Vertical division of mesosigmoid preserving marginal vessel d, Closure of lateral gutter-peritoneum on sigmoid to parietal peritoneum

sel insures adequate circulation to the projecting loop When this vessel has not been preserved, we have seen on occasion either the proximal or distal loops lose their viability so that stricture of the colostomy later occurred

A strip of moist gauze is passed through the rent in the mesosigmoid and the loop is drawn taut toward the median line The lateral gutter is then closed by interrupted or con-

tinuous sutures (Fig 204, d), joining the parietal peritoneum to the strip of peritoneum previously left along the sigmoid loop The proximal loop should come out directly without tension and the peritoneal sutures closing the lateral gutter should be at right angles to the bowel We believe the closure of the parietal peritoneum is quite important in all colostomies if small bowel obstruction is later to be avoided Furthermore, this suture line tends to anchor the colostomy firmly and of course determines its point of emergence from the wound

The layers of the abdominal wall are next closed in layers above and below the two projecting loops Appendices epiploicae are tied into the peritoneal sutures both above and below to further anchor the loop in the wound (Fig 205, a) No layers of the abdominal wall are drawn under the colostomy loop The peritoneum is closed snugly about both loops to a point that will permit the insertion of one finger beside them The rectus muscle is approximated by interrupted fine catgut sutures, these are used to obliterate dead space, for better hemostasis, and for good wound closure Interrupted sutures of chromic catgut close the fascia Braided silkworm retention sutures are usually used and include the anterior rectus sheath The fascia must not be closed as tightly as the peritoneal layer since the fascial layer will sometimes cause constriction about the loops

Following skin closure a glass tube is placed under the loops through the rent in the mesosigmoid and kept in place by rubber tubing on each end (Fig 205 b) Dry gauze is now placed about the loop beneath the glass tube to the extent necessary for elevating the loop properly The gauze does not extend into the wound

It will be noted with this technic that no sutures are taken in the bowel Fixation of the colostomy in the wound depends on the following steps

1 Closure of the parietal peritoneum obliterating the gutter

2 Inclusion of appendices epiploicae in the peritoneal incision

3 The adherence of the projecting loop to the different layers of the abdominal wall

4 The glass tube

5 Dry gauze above the wound in contact with the project
ing loop If the colostomy has been brought out satisfactorily
and with the proper amount of tension no trouble will be ex
perienced in providing a satisfactorily functioning colostomy

A dotted line is shown on the sigmoid (Fig 205 *b*) for the
point of later transverse division of the loop It should be
noted that this passes through the distal portion If a mod
erate degree of obstruction is present a catheter can be sewed
at the conclusion of the operation into the proximal loop pass
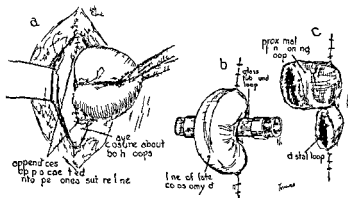
F g 205 — Both loops brought out together Appendices ep plo ae ar
t ed into pentoneal sutures to anchor colostomy n wound *b* Operat on com
pleted show ng glass tube under loop and po nt for subsequent transverse
d vis on *c* Show ng freshly divided loop to obta n a sat sfactory funct on ng
colostomy The proximal loop is long

ing through the position just indicated Usually there is a free
passage of gas over the loop so that transverse division can be
delayed for several days At times the colostomy is opened in
twenty four to thirty six hours without disturbing the gauze
packed about the loop No purse string suture is necessary
with this delay

Complete transverse division should be carried out in all
loop colostomies This is usually done without anesthesia with
the actual cautery Dividing the bowel at the point indicated
in Fig 205 *b* a long proximal loop is left This is trimmed off
with the cautery so that 1 to 1½ inches projects beyond the

skin level   The distal loop is trimmed down until it projects ½ inch above the skin (Fig 205, c)   Gradual shrinkage of the two loops leaves the distal loop level with the skin and the functioning proximal loop forms a small inconspicuous mound ¼ inch above the skin

In obese patients with short sigmoidal mesenteries it is sometimes difficult to get sufficient mobilization to permit delivery of a satisfactory colostomy   In such cases the peritoneal attachments can be severed proximally to free up the descending colon and even the entire splenic flexure   This will permit easy delivery of a loop of descending colon   Since we are referring to permanent colostomies, we prefer not to utilize the transverse colon

In other obese individuals, at the completion of the operation the loop may not project as far as desired   In these cases I have "umbilicated" or "dimpled" the wound at the site of emergence   This is done by anchoring the fascia to the under side of the skin, obliterating the fatty layer of the abdominal wound so that it is not in contact with the colostomy   Two sutures can be taken on either side of the projecting loops and one taken at each end which includes both sides of the skin and closed fascial layer   It is not necessary to excise any of the fat   As a matter of fact this dimpling of the colostomy wound gives a very satisfactory colostomy which is in no wise prominent   This procedure also serves another purpose   Patients with a fat abdominal wall frequently have some retraction of the colostomy into the wall   This interstitial position is always in the fatty layer, and it has not occurred in patients who have had this depression of the skin edges

It is necessary at times to place the colostomy in the proximal colon   The left rectus incision which we employ permits extension of the same incision upward so as to readily mobilize the transverse colon   Colostomy is performed in the transverse colon when the sigmoid is bound down by the lesion making colostomy in the descending colon and sigmoid difficult   Patients with obstruction due to diverticulitis should usually

n the trans   c

inches The rent is made in the transverse mesocolon care
fully preserving the middle colic artery and the loop is with
drawn and anchored as previously described The loop is
rotated so that the proximal loop is above and appears similar
to a sigmoidal colostomy

When the loop colostomy is temporary we have employed
the Mikulicz principle as described by Dr Lahey on page 637
for carcinoma of the colon This permits complete division
yet a satisfactory spur is created so that it can be divided
safely when the lumen has been reestablished distally Extra
peritoneal closure of the colostomy can then be readily carried
out This Mikulicz type of colostomy has been particularly
useful in the treatment of diverticulitis with obstruction or
with sigmoidal vesical fistula When temporary colostomy has
been performed simply by drawing out a loop in the transverse
colon later closure has at times necessitated an intraperitoneal
operation

We have previously described our management of colos
tomy in the *Surgical Clinics of North America* (June 1938
p 755) Since no sphincteric action can be employed in the
regulation of the discharge from a colostomy other means for
regular evacuation of the colon must be utilized In order
that a colostomy will not be a nuisance to the patient it should
be regulated to move at the discretion of the patient This
control is obtained by a colostomy irrigation or enema taken
every second or third day A regular schedule should be car
ried out Until control is gained dietary restrictions are neces
sary but once the routine is established there are few foods
that cannot be tolerated We do not recommend a colostomy
belt or apparatus A small pad is worn over the colostomy be
tween irrigations and this is changed twice daily It is held
in place by a small elastic band about the abdomen The de
tails of colostomy management will be found in the article re
ferred to above

A technic of loop colostomy has been described which is de
signed to avoid complications and to insure satisfactory func
tion This technic has been used in a large number of cases
and its value has been clearly established

TWO STAGE ABDOMINOPERINEAL RESECTION
(LAHEY)

RICHARD B. CATTELL

It is well recognized that surgery offers the only cure for carcinoma of the rectum A number of different types of operations have been devised and utilized for this condition and it must be admitted that different types of operation are required to treat successfully any large group of these patients A successful operation for cancer of the rectum must remove the lesion with wide margins for safety, together with large portions of the mesentery supplying this portion of the bowel At the time these patients come to the surgeon, less than half have the lesion confined to its primary site If operation is to give a chance for cure in the additional less favorable cases, it must be a radical procedure, and because of the danger of unrecognized spread in all cases, the operation should be carried out as radically as the patient will stand Unquestionably pursuit of this policy in the treatment of all cases of carcinoma of the rectum will yield the best results

The ideal operation for carcinoma of the rectum is the one stage abdominoperineal resection described by Miles We do not believe, however, that this operation can be applied in all cases Our own experience has shown that too wide utilization of the procedure will result in a high incidence of postoperative complications and in a high operative mortality A number of modifications of abdominoperineal resection have been described by Charles Mayo, D F Jones, Coffey, Rankin, Pfeiffer and others These procedures have been employed sufficiently to demonstrate their advantages and disadvantages Ten years ago Dr Lahey described another modification of the one stage operation, dividing it into two stages This operation

eration has been used in over 175 cases of resection for carcinoma of the rectum in this clinic, as well as for endometriosis diverticulitis and ulcerative colitis

We have previously reported the types of operations which we utilize for carcinoma of the rectum These are

1 One stage abdominoperineal resection (Miles), which we now employ in approximately 20 per cent of our cases

2 Two stage abdominoperineal resection (Lahey), which is used in 60 per cent of our cases

3 Anterior or abdominal resection in one stage, which is employed in 5 per cent of the cases

4 The older operation of loop colostomy and perineal resection, which is carried out in 15 per cent of cases

The utilization of these four operations for resectable lesions has permitted a gradual extension of operability so that at present, few patients with carcinoma of the rectum are found who cannot have some chance of benefit by some one type of resection if only palliation is offered

The Lahey type of resection has been utilized by a number of other surgeons so that, in the ten year period since its original description, it has had a thorough trial There are clear cut advantages in this type of resection The division of an operation of this magnitude into two stages has shown the same benefit that two stage operations have in other fields of surgery The resection has the same degree of radicability as the one stage operation, since the same segment of bowel and just as much mesentery containing the area of glandular spread are removed It can be applied to the poor risk group of patients in whom abdominoperineal resection has frequently not been applied This is particularly true of patients of advanced age It permits the removal of a large portion of malignancy in the inoperable cases, and frequently gives good palliative relief in these cases

One of the most important advantages comes from having —   —   —   —   the time of the extensive
                                                    The ileus and obstruc
                                          one stage operation can
usually be avoided by this two stage operation The implantation of the distal loop permits the irrigation of this lowest loop of the bowel which contains the carcinoma This leaves a

clean segment at the time of removal of the rectum since all
fecal material and the bloody and mucoid discharge from the
lesion is cleared away This advantage has been demonstrated
during the second stage when the lesion has been inadvert
ently ruptured during the abdominal resection without the
production of peritonitis This irrigation and decompression
of the tumor bearing portion of bowel further permits a de
crease in the inflammatory reaction around the tumor so
that frequently at the second stage a lesion will be found to
be more readily removable than was thought possible during
the first stage exploration This operation has further been
adapted to cases where perforation of the lesion with local
abscess has occurred The first stage can be accompanied by
drainage of the abscess with the area walled off with omentum
so that these patients may still receive the benefit of resec
tion I am sure these cases have frequently been considered
inoperable

We have recognized certain disadvantages to this operation
and have had others called to our attention The lesion is
left in place for at least two weeks longer for the interval be
tween the two stages This is probably not an important delay
in view of the long standing history in these cases It is
necessary to reenter the abdominal cavity at the second stage
and this may lead to certain operative difficulties resultant
from the first stage Likewise the technical difficulties asso
ciated with the second stage might be considered greater due
to implantation of the loop in the lower end of the second in
cision In our early experience with this operation technical
difficulties arising from abdominal adhesions were encountered
but these have now largely been done away with by later
changes in the technic of the first stage (These changes will
be described in the technic of the operation) The point has
also been raised that there is additional danger in submitting
the patients to two anesthesias and to two major operations
with all the attendant risks These risks are certainly not as
great as those associated with the one stage operation improp
erly applied and we do not believe that this is a valid dis
advantage

The most common objection is that the procedure does not
divide the abdominoperineal resection into two equal parts It

must be admitted that this is the case, since the first stage merely establishes the colostomy, with division of the meso-sigmoid, and does nothing toward completion of the resection It is our firm conviction, however, that the advantages of this two stage abdominoperineal resection far outweigh the disad vantages With an increasing experience in the treatment of carcinoma of the rectum, we have found it necessary to utilize this operation in a majority of our cases Because this op eration has continued to prove useful, the technic as employed today will be described

Spinal anesthesia is employed in all cases, both for the first and second stages The drug used is pontocaine in 10 per cent glucose solution, using 12 to 20 mg of the drug This will insure satisfactory relaxation and anesthesia for from an hour and a half to two and a half hours Nupercaine in 1 1500 dilution has been used for some of the second stage operations employing 15 to 20 cc of the solution The latter permits immediate Trendelenburg position and anesthesia for from two to four hours Since the first stage operation requires one half to one hour and the second stage from one to two hours, satisfactory anesthesia is provided in all cases by the use of one of these two drugs

TECHNIC OF TWO-STAGE ABDOMINOPERINEAL RESECTION (LAHEY), FIRST STAGE

The incision is made through the left rectus muscle, split ting the middle and outer thirds, and the incision extends equally above and below the level of the umbilicus This per mits satisfactory abdominal exploration and furthermore is used for all operations for carcinoma of the rectum No de cision as to the type of operation to be employed need be de cided upon until abdominal exploration is carried out Thus if the lesion is found inoperable, loop colostomy will be per formed, as described on page 649, or if resection is feasible, any type of operation which we employ can be proceeded with If the abdominal or one stage abdominoperineal is decided upon, the incision is extended downward Furthermore, this lateral incision offers the best exposure for the first stage of our two stage abdominoperineal resection since the first stage is confined to the sigmoid This lateral incision serves as the

site of emergence of the end colostomy and does not interfere with the subsequent midline incision for the second stage

Following abdominal exploration the sigmoid colon is lifted up and the small intestines packed away with moist gauze to the right   The avascular reflection of the parietal peritoneum onto the sigmoid colon laterally is divided to the level of the iliac vessels below and continued upward along the descending colon   This permits satisfactory mobility and elevation of the loop of sigmoid by freeing up the mesosigmoid by blunt dissec tion and retracting it medially

The left colic artery and sigmoidal branches of the inferior mesenteric can then be visualized or palpated and the site for division of the sigmoid selected, based on the distribution of vessels and mobility of the colon proximal and distal to this point   The peritoneum over the mesosigmoid is then incised on each side so that the anastomotic vessels between the sig moidal and left colic arteries can be secured individually   The mesosigmoid is divided vertically down to the superior hemor rhoidal vessels which must be carefully preserved to nourish the distal loop (Fig 206 *a*)   These can be readily palpated slightly to the left of the lumbosacral promontory   *The pres ervation of these superior hemorrhoidal vessels is the most essential part of the first stage operation*

The lower abdominal wall is now elevated, with the hand in the wound identifying the upper reflection of the bladder, and a short stab incision is made suprapubically in the mid line   Through this a curved clamp is passed to grasp the sig moid colon distally at the point for division (Fig 206, *b*)   A second clamp is then placed through the original wound on the proximal side and the bowel is divided between the clamps   The curved clamp can be withdrawn from the stab incision without soiling the abdominal cavity so that the distal loop projects a short distance above the skin (Fig 206, *c*)   The skin is loosely closed about this loop and gauze is wrapped around the bowel below the clamp   This suffices to hold the distal loop in place

The proximal loop is now lifted up and the point is selected for anchoring the colostomy in the wound   The lateral gutter is closed by suture of the parietal peritoneum to the peritoneum

along the border of the sigmoid, having this suture line at right
angles to the wound (Fig 206, c)
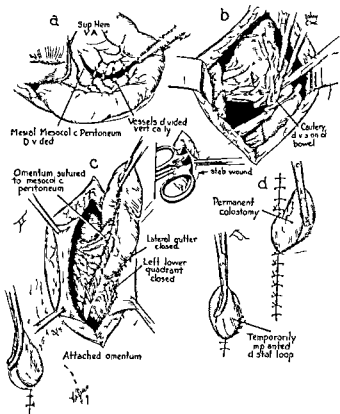
Fig 206—a Loop of sigmoid freed The mesos gmoid is d vided *pre
serv ng the super or hemorrhodal vessels* b Curved clamp passed through
suprapubic stab wound to grasp distal sigmo d The bowel is divided by
cautery c Lateral gutter closed Omentum sutured to cut edge of meso
sigmoid clos ng off left lower quadrant of abdomen d Completed first stage
showing proper projection of implanted loops

The free edge of the oment   th
with interrupted sutu
sigmoid It is best t

superior hemorrhoidal vessels following this with anchorage of the omentum to the distal mesosigmoid The final suture includes omentum mesosigmoid and anterior abdominal wall peritoneum at the point of emergence of the distal loop The omentum is next sutured to the mesosigmoid of the proximal loop (Fig 206 c) up to the point where it will emerge from the peritoneum The wound is now closed in layers about the proximal loop anchoring tabs of fat or appendices epiploicae at each side of the peritoneal closure The layers of the wall must not be closed too tightly as it should be possible to insert a finger alongside the bowel Retention sutures should be used The proximal loop should project for 1½ inches above the skin level (Fig 206 d) If at the completion of the operation it does not project for a satisfactory distance the skin can be anchored to the fascia dimpling or umbilicating the colostomy (see page 654) Gauze is placed about the bowel beneath the clamp so that the loop is held firmly in place If a moderate degree of obstruction is present the clamp can be removed at this point and a catheter inserted into the bowel for immediate decompression This completes the first stage

During the interval between stages the following steps are carried out As a rule the clamp on the colostomy is removed in thirty six hours and a catheter is inserted The lower clamp is removed in five days and beginning on the sixth day, through and through irrigations of the distal segment of bowel are carried out twice daily Colostomy irrigations are given as needed The usual interval between the first and second stage is fifteen days

SECOND STAGE

Abdom a I D st

bladder and permitted to drain during the abdominal dissection The colostomy is walled off by a small square of adhesive following which the distal loop is closed by a continuous suture The abdomen is redraped and a midline incision is made opening the abdomen just below the umbilicus This permits entry to the abdominal cavity without encountering

adhesions (Fig 207, a) The incision is then extended down ward, enclosing the implanted loop, and the latter can be quickly disengaged, taking care to avoid injury to the bladder The omentum, which will be found attached to the meso sigmoid of the distal loop, can be disengaged by blunt dissec tion down to its point of attachment over the superior hemor rhoidal vessels The attachment of the omentum to the proximal loop is left undisturbed A sheet of rubber dam is tied over the freed lower loop to avoid soiling during the abdominal dissection

From this point on the operation is similar to the remainder of a one stage abdominoperineal resection The superior hem orrhoidal vessels are lifted up above the sacral promontory, or at any desired height, after identification of both the right and left ureters It is particularly important to visualize the left ureter before division of the superior hemorrhoidal ves sels since they are in close relation on this side Following division of the superior hemorrhoidal vessels, an incision is made on each side in the peritoneum of the lateral pelvic wall just medial to the course of the ureters (Fig 207, b)

These incisions pass anteriorly to meet in the median line and they differ in male and female patients In the male the anterior incision in the peritoneum is made approximately one third of the way up on the fundus of the bladder from its re flection over the rectosigmoid In the female, it crosses the uterosacral ligaments at the level of the cervix, at which point the vaginal plexus of veins is encountered

The posterior dissection is then completed bluntly with the hand to a point below the tip of the coccyx If the malignancy is extensive in the pelvis, it is desirable at this point to resect the presacral nerve The lateral attachments are then divided by a combination of sharp and blunt dissections down to the body of the levator muscles The entire segment is then dropped back to permit the complete anterior exposure In the male the bladder is freed off by blunt dissection, at which time the vesicles will be encountered and the dissection con tinued down to expose the prostate In the female, the an terior dissection frees the rectum from the cervix and upper third of the vagina If there is extension of the malignancy to the cervix, uterus, or broad ligaments, panhysterectomy can

be readily carried out at this point, leaving the uterus and its appendages attached to the rectal segment The entire group of structures can be reduced into the pelvis for delivery per-
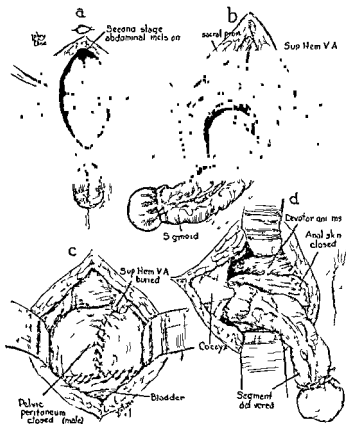
Fig 207.—a, Second stage lower midline incision abdomen opened above implanted loop No adhesions are encountered b, Division of superior hem orrhoidal vessels and incisions of peritoneum on lateral pelvic wall c, Closure of pelvic peritoneum in the male A relaxed peritoneal diaphragm is desired d, Perineal incision, bowel delivered and coccyx preserved

ineally With these steps completed, there will be good mobil ity of the entire segment of bowel, so that it can be elevated 3 or 4 inches above its previously attached level. This will

permit complete inspection of the pelvis including the major portion of the exposed levator ani muscles

The freed up segment is reduced into the pelvic space with the leading point being the free end At times it is necessary to remove a segment of the bowel in order to permit satisfactory reduction *The most important step in the second stage of the operation consists of freeing up of pelvic peritoneal flaps so that the pelvic peritoneal diaphragm can be reconstructed without tension* This is done by a combination of sharp and blunt dissection well beyond the ureters The pelvic peritoneal diaphragm is usually constructed by sutures in two directions (Fig 207, c) It can be further reinforced by means of the broad ligaments or uterine fundus, or by anchoring the portion of omentum to it which has been freed from the distal meso-sigmoid

The abdominal wound is closed in layers, utilizing continuous chromic catgut in the peritoneum and interrupted chromic catgut in the anterior rectus sheath A small, rubber tissue drain is brought out from above the level of the peritoneum to the lower angle of the incision Interrupted retention sutures are used being spaced ½ inch apart

Perineal Portion—The patient is turned on the left side in a modified Sims' position This permits adequate exposure of the perineal region The anus is closed by two purse-string sutures and the wound redraped An elliptical incision is made with the lateral borders being over the ischial tuberosities so that all of the intergluteal fold is removed The coccyx is left in place and a transverse incision is made from one side of the pelvic outlet to the other down through the deep pelvic fascia This incision enters the presacral space of the abdominal dissection The posterior two thirds of the levator mus

remaining attachment of the levator muscles and transverse perineal muscles divided In the female a finger placed in the vagina aids in facilitating the dissection between the anterior rectum and this structure If the lesion is anterior in the female, the posterior portion of the vagina is resected with the lesion

The entire pelvic space can now be inspected under direct vision and satisfactory hemostasis secured A small cigaret drain is placed in the pelvic space and the wound is closed about it, bringing the drain through the midportion of the incision

At the completion of the resection a blood transfusion of 500 cc is given

The posterior drain is removed on the fourth postoperative day, as is likewise the suprapubic drain Beginning on the sixth day the posterior space is irrigated twice daily

We have utilized this two stage abdominoperineal resection in over 175 cases of carcinoma of the rectum We feel that its value has been clearly demonstrated It has been one of the important factors in increasing our operability rate from 55 per cent in 1927, to 89 per cent in 1937 The operative mortality for this operation, even when adapted to poor risk patients and those with extensive malignancy, has remained between 10 and 13 per cent Furthermore it has given as good results so far as recurrence goes as the one stage abdominoperineal resection

THE TREATMENT OF HEMORRHOIDS

Neil W. Swinton

Nearly everyone during his lifetime has symptoms caused by hemorrhoids, and a large number of people will at some time require measures for the relief of these difficulties Historically, hemorrhoids have been discussed since the days of the Old Testament, but it has been only within recent years that the majority of surgeons have appreciated the importance of their management In the past "piles" were treated principally by quacks and so called "rectal specialists" who, by advertising and promising "painless cures," aided some people but mistreated many more

As a result of the influence of certain pioneers in the field of rectal surgery and the demands of patients for improved results certain fundamentals have been developed in the treatment of this condition which, when properly utilized, give the utmost satisfaction to patient and surgeon alike

The diagnosis of hemorrhoids is usually obvious and needs no discussion, but the importance of the examination of patients who complain of blood or mucus in their stools, rectal or anal pain, or any abnormality of the stools or bowel function cannot be too strongly emphasized if malignant lesions are to be discovered at an early stage When first seen these patients should be given a careful digital examination of the rectum and proctoscopic examination of the anal canal, rectum, rectosigmoid region and lower part of the sigmoid If the cause of bleeding is not obvious from these studies, roentgenographic examination, after the administration of a barium enema with contrast air films of the colon, should be carried out These examinations should be made in this order

When one realizes that approximately 70 per cent of all malignant lesions of the large bowel are within reach of the

examining finger and sigmoidoscope the importance of these examinations will be appreciated This patient, who was seen in our clinic today is but an example of what is occurring all too frequently This patient, a woman fifty years of age had noticed rectal bleeding nine months ago One month after the onset of this symptom she reported to her physician and was given medicine by mouth, a supply of suppositories and a word not to be alarmed, that her "piles" would clear up very soon
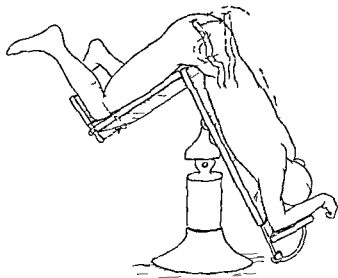
Fig 208 —Buie's modification of the Haynes table Note straightening out of the rectosigmoid area in the inverted position Note also elevation of the abdomen from the table by elevation of knee and leg rest

The patient had seen her physician at least once a month since that time Two roentgenologic studies after a barium enema were reported to have given negative results, but it was not until the week before she came to the clinic that her physician had made even a digital examination on this patient At the time she came to the clinic there was a mass filling the ampulla of the rectum that could have been recognized eight months previously had the physician taken the time and trouble merely to insert his finger into her rectum Roent

genographic studies of the ampulla of the rectum and region of the rectosigmoid frequently do not reveal early tumors

At the clinic, sigmoidoscopic examinations are being made in all cases in which there is a history of abnormal stools or of recent change in bowel function

Fig 209 —Knee chest position Note extension of back

Buie's modification of the Haynes table (Fig 208) is of great assistance in routine proctoscopic examinations, although the simple knee chest position (Fig 209) is satisfactory for the majority of patients In the inverted position the straightening out of the rectosigmoid angle is of great assistance in

Fig 210—The left lateral Sims position useful for rectal and proctoscopic examinations in very obese or seriously ill patients Note elevation of hip with folded pillow

visualizing the lower part of the sigmoid The left lateral Sims position is also very useful for the seriously ill patient (Fig 210)

In the following discussion certain principles that are employed at this clinic in the management of patients with hemorrhoids will be discussed

Our knowledge of the anatomy of the anorectal region has materially increased in recent years and, to understand properly many of the important factors underlying the treatment of hemorrhoids, it is necessary to appreciate certain facts relative to the structures in this region Milligan and Morgan have reported some excellent studies on the anatomy of the anorectal ring and Fig 211 has been suggested by their work

The mucosal lining of the rectal canal extends downward to the region of the anorectal ring It is made up of columnar
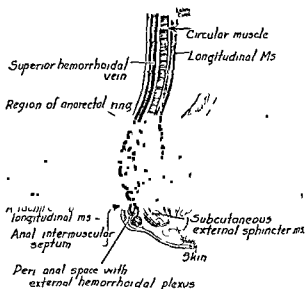
Fig 211—The anatomy of the anorectal ring as suggested by Milligan and Morgan (See text for discussion)

epithelium and is of a transparent consistency and is pale pink The artery entering the pedicle of each hemorrhoid can usually be palpated beneath this layer Extending from the anorectal ring down to the valves of Morgagni or anocutaneous line is the anal mucosa this is of a darker color due to the venous blood in the underlying internal hemorrhoidal plexus This region is made up of low cuboidal epithelium The rectal and anal mucosa are not sensitive to pain Below the valves

and extending to the peri anal skin is an extremely sensitive area of anal skin which is made up of stratified squamous or transitional epithelium without sweat glands or hair follicles

It will thus be seen that the first part of a prolapsing hem orrhoid to be seen is covered with anal skin, followed by the darker colored anal mucosa The rectal mucosa is seldom ap parent to external examination

The subcutaneous division of the external sphincter has an important function in the musculature of the anal canal It is the 'pucker string" of the rectum and the muscle which causes
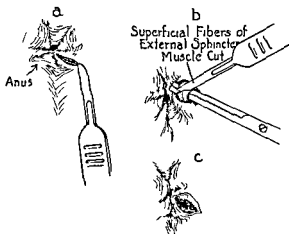
Fig 212 —The division of the subcutaneous portion of the external sphinc ter muscles This procedure rather than a traumatizing dilatation should be carried out when there is a tight contracted sphincter ring

pain due to its spasm in cases of anal fissure and thrombosed external hemorrhoids On the anterior surface of this muscle lies the external hemorrhodal plexus Above, it is separated from the superficial external fibers by a definite intermuscular septum from the lower end of the internal sphincter muscle by the insertion of the longitudinal muscle of the anal canal The exposure and division of this muscle may be seen in Fig 212

The longitudinal muscle of the rectum extends downward, envelops the internal sphincter muscle and, passing between

the lower border of the internal sphincter and subcutaneous external sphincter becomes attached to the skin at the anal intermuscular septum   A few of the fibers of this muscle extend outward under the peri anal skin and are called the 'corrugator cutis ani   The dimple or groove on the surface of a prolapsed hemorrhoid is the line of attachment of the longitudinal fibers

the insensitive mucosa that injections of internal hemorrhoids are given

A fissure rarely extends into this space and because of the protection afforded by the attachment of the longitudinal muscle, the majority of anal fistulas do not extend into this region

The peri anal space contains the external hemorrhoidal plexus   Pathologic conditions in this area contrary to those in the submucous space are characterized by pain   Thrombosed external hemorrhoids occupy this region   Fissures overlie the area and the extension of infection from the base of fissures into this space results in peri anal abscesses and fistulas

The blood vessels beneath the rectal mucosa can usually be seen and the pulsation of the artery palpated   There are usually three primary pedicles on the right in an anterior and posterior position and on the left in a lateral position   Milligan and Morgan believed that most of the blood from the external

the discomfort is so intense that some type of treatment is demanded   The release of the clot will ordinarily relieve the pain and cure the condition   Small clots may be removed in the office   Infiltration of the hemorrhoid with 1 per cent novocain will afford sufficient anesthesia   In Fig 213 the removal

of a thrombosed hemorrhoid is demonstrated   It is important
to do more than a simple incision of the hemorrhoid and evac-
uation of the clot   The wedge-shaped excision of the throm-
botic area insures against the formation of subsequent skin
tabs and the recurrence of clots   Very extensive prolapsed
thrombotic hemorrhoidal masses are best treated conservatively
for a period before any surgical procedure is carried out   This
is particularly true if infection or gangrene is associated   These
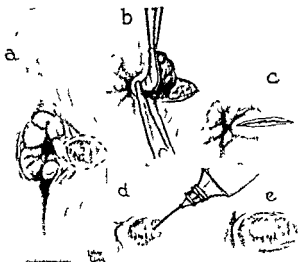
Fig 213—The removal of a thrombosed external hemorrhoid   In d the
hemorrhoid is injected with 1 per cent novocain   e the distended thrombosed
hemorrhoid   Note in a and b that the skin overlying the hemorrhoid together
with the underlying clot is removed   c The resultant defect may if necessary
be closed with a single catgut suture

patients should be hospitalized, kept in bed and hot wet dress-
ings or ice packs should be applied to the area   Conservative
measures attempting to reduce the prolapse and strangulation
may be carried out

The treatment of internal hemorrhoids has been the subject
of considerable dispute in the past and the matter is still far
from settled   In our own experience we have reached quite
definite conclusions with regard to the value of the injection
type of treatment versus the operative treatment   External

hemorrhoids must never be injected Internal hemorrhoids can in many instances be injected with very satisfactory results and in certain selected cases the results of treatment are excellent Unfortunately this number in our experience has not been large There can be no doubt that there is a very definite and close relationship between internal and external hemorrhoids Patients with hemorrhoids that are entirely internal are less in number than has commonly been supposed Internal hemorrhoids complicated by infection or thrombi must not be injected In our experience, about half of the patients with what may be called "primarily internal" hemorrhoids are not suitable for injection treatment

Internal hemorrhoids associated with spasm of the sphincters or pain of any type have not in our experience been satisfactorily managed by injection therapy alone In some cases marked prolapse accompanying internal hemorrhoids has been relieved temporarily following injections, but the end results in this group have, on the whole, been unsatisfactory We have found that the injection type of treatment of internal hemorrhoids is suitable for the temporary relief of patients with sm

by

but

Bleeding, which is so commonly associated with internal hemorrhoids can nearly always be stopped by injections and we believe that this fact alone justifies the use of the injection plan of treatment in many selected cases The morbidity and expense associated with the operative treatment will influence many patients in whose case injections are not contraindicated to choose conservative therapy

In discussing the treatment of hemorrhoids with patients we carefully explain to them that the incidence of recurrence following injection therapy is high

Phenol has been used for the injection of hemorrhoids since 1871[2] It has been in ill repute in the past because of improper use Too strong solutions faulty technic in the injection of the solution and improper selection of cases have in the past led to abscesses fistulas and many serious complications Quinine and urea hydrochloride first described by Terrell in 1916 has been very popular and in the past has

probably caused fewer serious complications than phenol   We
have given both solutions a trial and at present favor the 5 per
cent solution of phenol in almond oil for routine use   In our
experience the phenol solution has given more lasting results
than the quinine solution, although we appreciate that it must
be employed with considerable care

In Fig 214 the Luer syringe and the type of needle used
at the clinic for the injection of hemorrhoids are shown   The
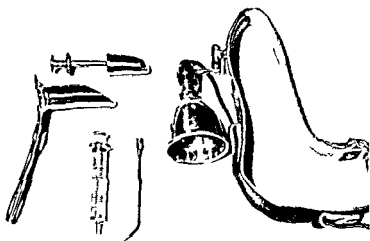
F g 214—The Luer syringe needle headlight and Hirshman type of anoscope
used in the injection treatment of hemorrhoids

Hirshman anoscope has been very satisfactory in our experi
ence   Some type of illumination is essential and we have
found that any simple headlight such as that shown is excel
lent for this purpose

The needle must be inserted through the anal mucosa above
the anocutaneous line well into the internal hemorrhoidal
plexus   Phenol injected too superficially will cause ulceration of
the mucous membrane   No attempt is made to withdraw blood
after the needle is inserted into the hemorrhoid, in fact, in our
experience we have never been able to withdraw blood into
the syringe on repeated trials in many cases   One to two cubic
centimeters of phenol is injected into each hemorrhoid   The

three primary pedicles are first treated   One or two areas are
injected at a time, and usually one treatment is given each
week   Three to six injections are usually sufficient   The in
jection of phenol or urea hydrochloride into the internal hem
orrhoidal plexus causes a perivascular fibrosis resulting in the
scarifying of the hemorrhoid   This principle thus differs from
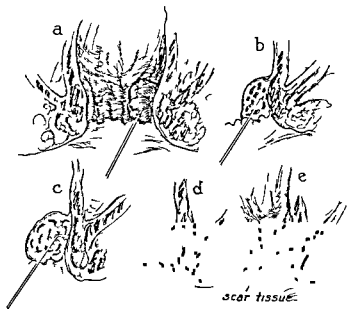
F g 215—The injection treatment of hemorrho ds a the needle inserted
into the internal hemorrho d well above the anocutaneous line and deeply in o
the hemorrho d b a cross section showing the t p of the need e in a peri
vascular position c the distention of the internal hemorrho d d and e the
resultant scarification

that used in the injection treatment of varicose veins of the
lower extremities   In Fig 215 the successive stages in the
injection with resultant scarification of an internal hemorrhoid
are shown   Figs 211 and 216 demonstrate the position of
the internal hemorrhoid and its relation to the anocutaneous
line and the external hemorrhoid

In a large series of patients treated at the clinic during the

past five years there have been no serious complications. No abscesses, fistulas, or extensive ulcerations have developed There has been no death Very extensive areas of induration and thrombosis, extending well up along the wall of the rectum, have developed in two cases after injections In one case they were so extensive that the ampulla of the rectum was nearly filled with a large indurated mass A low grade fever and considerable aching and discomfort in the rectum were associated We do not know exactly what caused this extensive reaction It may have been due to injection into the lumen
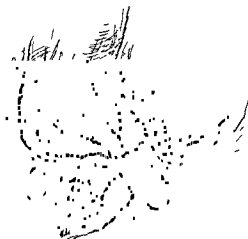
Fig 216 —The relative position of internal and external hemorrhoids in relation to the anocutaneous line

of a vessel, although we have not seen any similar complications reported in the literature Both patients made excellent recoveries, the induration and fever subsiding within two or three weeks

The incidence of recurrence in our series has been high, but when our patients have understood this possibility in advance, they have on the whole been very well satisfied with the results of

i

to attain in the preparation for operation, the *technic of the*

operation and, most important, in the postoperative care of these individuals With our present knowledge of anorectal surgery, few patients will regret having undergone an operation for the removal of hemorrhoids It is a field of surgery however, that has been too lightly passed over in the past by the average surgeon Too often one encounters the patient who, when advised to undergo operation, mentions the friend who has had his ' piles burned out' years ago and has told everyone ever since that he would rather die than go through a similar experience The patient who has undergone one of the early improperly performed Whitehead operations has too often been unhappy ever since This has been justified in the past, but today, hemorrhoids may be removed surgically with no more discomfort than with many other surgical procedures the morbidity is not great, and the end results more than justify the effort

The majority of rectal surgeons have discarded the clamp and cautery method for the removal of hemorrhoids The hemorrhoidal areas were not completely removed in many instances, the pain and discomfort due to edema and infection after operations of this type were severe, and the end results were on the whole not satisfactory Skin tabs, excessive scarification and the recurrence of hemorrhoids were all too frequent At the clinic we have completely discarded the clamp and cautery method for the removal of hemorrhoids

Our patients are admitted to the hospital the evening preceding operation and given a light supper A cleansing enema of saline solution (3 pints) is given the morning of operation and the peri anal area is carefully shaved No attempt is made to ' tie up' the bowels and no cathartics are given All operations on the anorectal canal must be carried out in an infected field and attempts to sterilize the region are futile

General anesthesia for this type of operation has largely been given up at the clinic Local anesthesia can be used for most of these operations and is being used by the majority of rectal surgeons We have found spinal anesthesia to be the most satisfactory for both patient and surgeon and we utilize it in the majority of our cases The drug pontocaine in solution with glucose is used at the present time 6 to 12 mg being the usual dose required Dr Sise is reporting in this volume on

spinal anesthesia for this type of procedure The arguments against spinal anesthesia in general will not be repeated here, but we fully appreciate that it must always be employed by men well trained in its use
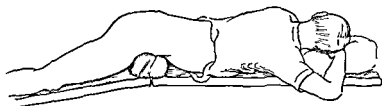
Fig 217—The Buie position for anorectal operations Note elevation of the pelvis

In Fig 217, a position which we have adopted from Buie and found very satisfactory in all anorectal operations is
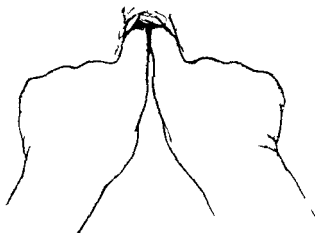
Fig 218—Dilatation of anal ring

shown There is one criticism of the position for use in routine performance of hemorrhoidectomy The slightly inverted position of the anorectal canal in this position may cause the

hemorrhoids to empty out in part, and in certain cases the Sims' or lithotomy position may be preferable

The field of operation is prepared with a 3 5 per cent solution of iodine and the buttocks are retracted, with an assistant on either side Dilatation of the rectum (Fig 218) is always
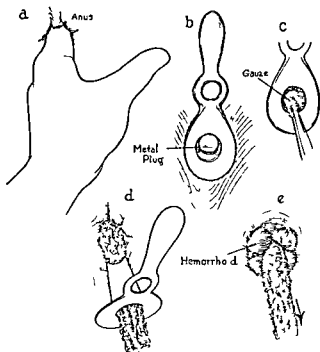
Fig 219 — A method of demonstrating the size and extent of hemorrhoids *a* simple dilatation of the anal ring *b* insertion of metal anoscope with removal of obturator *c* insertion into rectum of a gauze sponge *d* removal of anoscope leaving gauze sponge in rectum *e* by gently withdrawing the gauze sponge the degree of prolapse size and extent of the hemorrhoids are noted

done as the first step in any hemorrhoid operation This dilatation is not a rough, traumatizing tearing of mucous membrane and muscle, but a gentle adequate stretching of the parts In patients with a tight contracted anal ring the procedure shown in Fig 212 is carried out rather than a brutal dilatation of the

parts This division of the subcutaneous portion of the external sphincter has been to us one of the most satisfactory operations in the field of surgery There will always be an adequate anal aperture following the procedure and we have never noted any incontinence or other difficulty after operation Frequently, the subcutaneous portion of the external sphincter muscle will be found to be entirely replaced with fibrous tissue and dilatation of the rectum will be impossible without dividing it or manually tearing it apart It has been believed by some observers that this latter condition is similar to that which was first described by Abell as 'pectinosis'
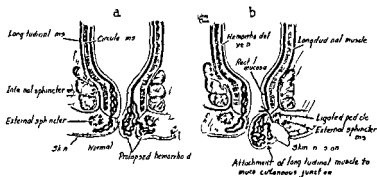
Fig 220—Anatomy of the anorectal ring suggested by Milligan and Morgan *a* position of prolapsed internal hemorrhoids *b* position of skin incision and reconstruction of anal canal used by us in a simple type of hemorrhoidectomy as demonstrated in Fig 221

Following dilatation of the anorectal ring the procedure shown in Fig 219 is of considerable value The exact extent of the hemorrhoids and the degree of prolapse can be determined and the type of operation to be carried out decided upon

At the clinic, we have adopted two standard procedures for the removal of hemorrhoids rather than attempting to utilize one technic for all situations The first procedure (Figs 220 and 221) is used for those patients whose hemorrhoids are not too extensive and when the three primary pedicles of the hemorrhoids can be easily distinguished The second procedure (Figs 222 and 223) is used in those cases in which the hem

orrhoids are very extensive and there is considerable prolapse of the mucous membrane Usually in this situation a complete encircling ring of large prolapsing hemorrhoids will be seen (Fig 224).
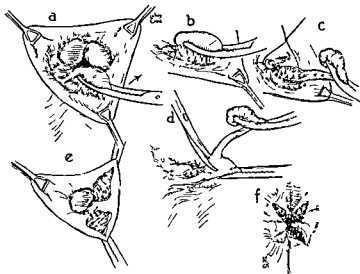
Fig 221—Technic for removal of hemorrhoids as shown in Fig 219 and retraction of anal margins by means of Pennington clamps *a*, following exposure of hemorrhoids as shown in Fig 219 and retraction of anal margins by means of Pennington clamps The prolapsing internal hemorrhoid is grasped with a clamp and pulled downward, *b*, the primary hemorrhoid pedicle is ligated at a high level with a No 1 plain catgut suture The blood supply to the hemorrhoid thus controlled, the internal portion of the hemorrhoid is then excised as shown by dotted line, *c*, the ligated pedicle is drawn downward and sutured securely to the subcutaneous portion of the external sphincter muscle, *d*, the external hemorrhoid and overlying skin tab is excised *e*, the suture of the ligated hemorrhoid pedicle to the subcutaneous portion of the external sphincter muscle is demonstrated with defects remaining following the excision of the external hemorrhoidal plexus and overlying skin tab *f*, the three defects left remaining after excision of the three primary pedicles and overlying hemorrhoidal tissue

The first procedure has been adopted with modifications
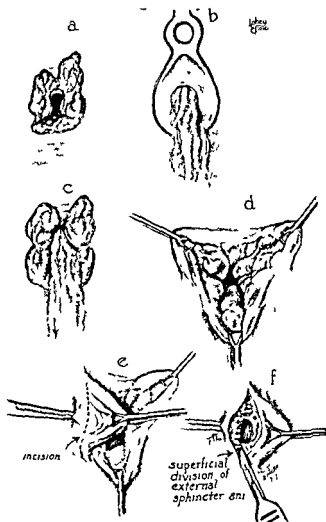
Fig 222—Amputative type of hemorrhoidectomy suggested by Buie *a* typical prolapsing complete ring of hemorrhoids *b*, *c* and *d*, exposure of hemorrhoidal masses *e* following application of Kocher clamps an incision is made in the position of the dotted line *f* the incision is carried down to the subcutaneous portion of the external sphincter muscles and all overlying hemorrhoidal tissue removed
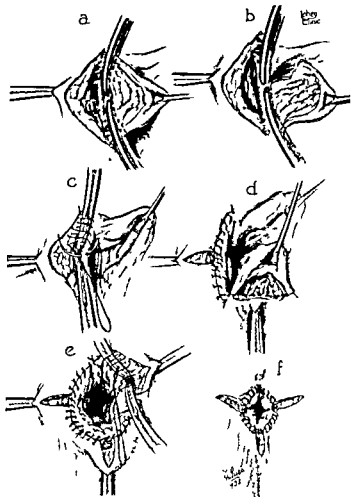
Fig 223—Amputative type of hemorrhoidectomy continued *a* and *b*
removal of redundant skin and external hemorrhoidal plexus above clamps
c reconstruction of the mucous membranes to the skin margins and subcutane-
ous portion of the external sphincter muscle *d* by suturing the border of the
mucous membrane to this muscle segment the correct position of the muco
cutaneous junction is determined The \ shaped defect left for drainage insures
breakdown
nd resultant
g to be re
for dra n

tion require attention to detail and careful postoperative management

In both types of operation a careful surgical dissection based on our knowledge of the anatomy of the anorectal region is carried out   The hemorrhoid bearing areas are cleanly removed and the mucous membrane reconstructed to the skin and musculature of the anal ring

Following operation, the patient is placed on his side and massive hot wet dressings are applied directly against the anus

F1 2 4—Extensive type of prolapsing internal and external hemorrhoids suitable for the plastic amputative type of hemorrhoidectomy

and buttocks These dressings promote drainage, prevent postoperative edema and infection and are our greatest aid in preventing postoperative pain We have not as yet perfected a painless operation for the removal of hemorrhoids, but any patient who has undergone a nontraumatizing surgical removal of his hemorrhoids and careful postoperative treatment will not have any of the horrible memories of the experience that so many patients operated on in the past have had

The hot wet dressings are changed every hour for forty-eight or seventy two hours and the patient changed from side

to side at those times They may be encouraged to stand up at the side of the bed if there is difficulty in voiding and few patients will require catheterization

No attempt is made to constipate these patients A liquid diet is given the first postoperative day, a soft diet on the second, and a "house day" on the third On the morning of the third day a small retention enema of "mazola" oil is given and, on the morning of the fourth day, a small saline enema is administered if necessary Mineral oil by mouth and other laxatives are never given Gentle digital examination of the rectum is made on the fourth or fifth postoperative day and this is repeated every few days until the anal canal is healed and comfortable

The majority of patients are discharged from the hospital on the fifth postoperative day and are encouraged to take daily sitz baths at home until they are completely cured A few patients who have undergone the more radical type of operative procedure should remain in bed for ten to twelve days after the operation

We believe very strongly that the care of the average patient with hemorrhoids is not completed at the time of their leaving the hospital Many of them are constipated and have bowel dysfunctions and cathartic habits These patients must be advised concerning their intestinal habits, and they must be followed after operation until they have normal bowel function Too little attention has been given by surgeons to this phase of the postoperative treatment of the patient with hemorrhoids If the end results are to be satisfactory normal bowel function must be restored before treatment is discontinued

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THE INJECTION OF ALCOHOL IN THE TREATMENT OF PRURITUS ANI

Neil W. Swinton

The management of the patient with severe pruritus ani is a complex problem Relief of the itching must be obtained in the shortest possible time by measures that will result in a high percentage of cures The cause of the anal pruritus must be discovered and removed in order to prevent recurrence

In this volume* two years ago the general subject of pruritus ani was discussed and the principal causes of anal itching mentioned We still believe that in every case of anal pruritus if sufficient time is taken a cause will be found Local ano rectal disease bowel dysfunctions pelvic disorders in women and genito urinary diseases in men occur in the majority of cases of this condition In other cases various skin conditions systemic disorders allergic diseases and parasitic infections are associated with the anal itching

Many patients seen at the clinic mention anal pruritus as a minor complaint and may be relieved of their anal discomfort by simple measures The correction of faulty local hygienic habits of various bowel dysfunctions elimination of various pelvic and genito urinary disturbances and of apparent anorectal pathologic conditions relieve many patients with mild anal pruritus There is however a group of patients who come to the clinic with a primary complaint of anal itching in whom more drastic methods of treatment are necessary Many patients with long standing severe anal pruritus are found to have hemorrhoids and other local disease It has been our experience that many of these patients obtain only temporary relief from hemorrhoidectomy and other local treatment that is not directed primarily against the anal itching A second

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large group with severe pruritus give very little evidence of local or systemic disease on initial examination and the etiologic factors behind the anal itching may require prolonged and extensive study

These groups of patients present a serious problem to the physician Salves, lotions, injections and radiation therapy have been given a thorough trial by the majority of these groups Local examination reveals the results of previous treatment and the scratching and secondary infection that has been introduced into the skin We believe that, in most cases pruritus ani begins as a symptom, a sense of discomfort in the region of the anus from some definite cause Scratching irritation of the parts and the introduction of secondary infection into the skin set up a vicious cycle of itching and scratching that may be so severe as to result in incapacitation, at times a patient is so desperate for lack of sleep and rest and freedom from his itching that he will do anything to obtain comfort In such cases, the anal pruritus is a definite disease entity and the original etiologic factor may be insignificant so far as immediate relief is concerned It is this group of patients with severe intractable itching, or as has been suggested by Buie with 'pernicious anal pruritus,' that we wish to discuss in this paper

An effective method for the complete relief of the patient with pernicious anal pruritus must be instituted as soon as possible Extensive study for systemic disease, foci of infection and allergic disorders can be carried out after he is comfortable At the clinic, in the past, a large series of patients with severe anal pruritus were treated with radiation therapy The immediate results were good but the end results showed an eventual recurrence in nearly every case A small number of patients were treated with anesthesia in oil preparations with the same results

We have now abandoned all other forms of treatment of the patient with severe anal pruritus for the subcutaneous injection of alcohol

The injection of alcohol is not directed toward the cause of the pruritus, but is given for the immediate relief of the pain and itching Alcohol causes destruction of the peripheral nerves to the skin of the peri anal area, resulting in anesthesia

Two different methods have been described for the injection of alcohol for this purpose The technic described by Stone (Fig 225, b), consists of making multiple punctures over the involved area and injecting small quantities of 95 per cent alcohol When we first began using the subcutaneous injection of alcohol for this disease we followed Stone's technic The immediate results were very satisfactory, sloughs were minimal and the patients were comfortable However, as more time elapsed, we found that the incidence of recurrence was too high to be entirely satisfactory and we have largely abandoned this method for the one described by Buie Occasional situations will arise when it is desirable to minimize the danger of sloughing in which case the method described by Stone will be very efficient for temporary, and at times permanent, relief

Alcohol is injected with the patient under general or low spinal anesthesia Injections after local block of the peri anal skin have not been satisfactory The procedure must be carried out in the hospital it is not an office procedure Careful preoperative shaving and preparation of the skin is important, but no attempt is made to produce constipation The technic described by Buie is shown in Fig 225 a Forty per cent alcohol is used for the injection, and 20 to 50 cc will be necessary for the average peri anal injection The alcohol is placed in the subcutaneous tissues between the skin and muscles

This is important If alcohol is injected too deeply, abscesses and destruction and scarring of the anal musculature may result If the injection is too superficial and into the skin itself sloughs will be extensive and healing time and disability will be unduly prolonged

The alcohol must be distributed evenly throughout the entire subcutaneous area that is involved In the past, we have found it necessary to repeat the injection in certain areas in a few cases in which even distribution of the alcohol was not accomplished and the relief of itching was not complete One very important point that we have found necessary for the success of this type of injection is the infiltration of the area nearest the anal margin It is necessary to dilate the anal canal as a preliminary procedure to smooth out the folds and rugae of the adjacent skin Care must be taken not to trau

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matize the anal margin unnecessarily, since the alcohol will leak out through perforations and an even distribution will be difficult to obtain   Then, with one or two fingers in the anal canal, the point of the needle is directed in such a way that there is a smooth, even distribution of alcohol beneath every portion of the involved peri anal skin   It is not necessary to continue the injection beyond the mucocutaneous line   A long

Fig 225—*a* Technic of subcutaneous alcohol injection for pruritus ani as described by Blue   Following dilatation of the rectum an even subcutaneous distribution of 40 per cent alcohol throughout the involved area is made   *b*, Technic of subcutaneous alcohol injection as described by Stone   Multiple punctures are made throughout the involved area and 2 to 5 minims of 95 per cent alcohol are injected subcutaneously with each puncture

small gage needle (No 20) is used and one perforation of the skin on either side of the anus is usually sufficient, all portions of the peri anal skin involved can ordinarily be reached from these two points   The most generous nerve distribution is found in the region of the anterior and posterior commissures, and usually a little more alcohol is placed in these two areas than elsewhere   Care must be taken however, not to injure the urethra in the male

Our tendency on first using this technic was to use insufficient alcohol. Our first patients treated in this manner obtained excellent temporary results, but many recurrences took place after a few months. Few sloughs occurred in this group. We have come to the conclusion, as Buie has frequently stated, that to obtain satisfactory end results sufficient alcohol must be used so that there will be frequent, and sometimes unfortunately quite extensive, sloughs. Very extensive sloughing of the perianal skin and subcutaneous tissues has resulted in several cases following injections of alcohol. Small abscesses have developed, and there has been profuse foul drainage from the area that has required considerable care for a long period of time. Healing has taken from six to eight weeks in several of these cases.

In spite of these difficulties, however, the patients have been relieved of their itching from the first. They have been more comfortable than they have been in years, have not minded the period of healing and postoperative care; healing has taken place with a minimal amount of scarring, and no stricture formation or other serious complication. Without exception, our patients in whom extensive sloughing has resulted from the injection of alcohol have been satisfied with the method of treatment and have been free from itching ever since.

The period of postoperative care is very important. It has been our policy to carry out minor operative procedures, such as the excision of skin tabs, drainage of crypts, excision of enlarged papillae and cauterization of the cervix, at the time of injection. We have not found these to interfere in any way with the r.....

expense and

dure such as extensive hemorrhoidectomy should not be done at the time of the alcohol injection. It has been our custom to carry out these operations first and, after healing has taken place to inject the alcohol.

The care of the skin and sloughing when it occurs following injection is important. When these patients recover from anesthesia there is usually a short period of burning in the parts, but this quickly subsides and the patients are then quite comfortable. Sloughing begins a few days after injection. We have found that hot potassium permanganate packs (1:10,000),

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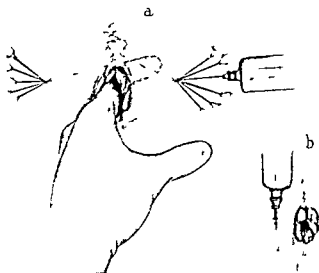
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A METHOD FOR THE PREVENTION OF POST-PUNCTURE HEADACHE IN CASES OF LOW SPINAL ANESTHESIA

LINCOLN F SISE AND NEIL W SWINTON

FOR several years we have been using low spinal anesthesia for operations on the anus and lower rectum, such as for hemorrhoids, fissure, and fistula This type of anesthesia has seemed to us superior to sacral block because of the following

It is quicker The technic is simple and rapid, and anesthesia appears immediately and is complete With sacral anesthesia the technic comprises multiple punctures, some of them occasionally quite difficult On its completion, anesthesia may be delayed ten or fifteen minutes The whole procedure may, therefore, take considerably longer than that with spinal anesthesia

It is less distressing to the patient There is but a single puncture and this is practically painless With sacral block there are multiple punctures, and usually frequent contact is made with bone While pain is not in any way severe, it is nagging and uncomfortable If toxic symptoms of more than slight extent appear, the patient is rendered exceedingly uncomfortable One of us has himself experienced both spinal and sacral block anesthesia and, if obliged to make a choice between the two, would unhesitatingly and emphatically choose spinal anesthesia

There are no toxic reactions The dose of the anesthetic drug is so small and the anesthesia is so low and so limited in extent that there is virtually no general effect on the patient With sacral block anesthesia, toxic systemic reactions occasionally appear and may in some instances be so severe as to be dangerous

Low spinal anesthesia seems superior to inhalation anesthesia because

and later sitz baths several times each day, are very helpful in drying out the skin and controlling infection Later a solution of 1 per cent phenol in calamine lotion applied during the day is helpful The skin as it heals resumes its normal tone and texture, and even in the few cases in which extensive sloughing occurs, scarring is minimal

During this period of convalescence other necessary studies can be carried out the correction of bowel dysfunctions studies of allergic disorders (when indicated), search for foci of infection, and all studies that will return the patient to a normal healthy individual

Too little time has elapsed for an accurate study of the end results in our own patients treated by alcohol injection Our results have continued to improve during the past three years since we have followed this method and we are certain that they are better than they have been under any other plan Buie in a series of 125 patients followed for over two years found 92 per cent completely relieved of their itching This is the highest incidence of cures reported of which we are aware

Summary—For the patient with severe intractable anal pruritus in our experience the subcutaneous injection of alcohol after the method described by Buie has given the most satisfactory results

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ducer previously described [1] Puncture was not, indeed, quite
as simple as with a larger needle, but the difficulty was not be
cause of the limberness of the needles, it was because these
fine, sharp pointed needles glide through all the structures en-
countered so easily that hardly any change in sensation is
transmitted to the hand   There is no 'snap' on piercing
either a ligament or the dura, only a faint change in resistance
which is easily missed   The chief difficulty with these needles
came after puncture had been made, and was due to the ease
with which the needle was blocked by anything which came in
contact with its end within the dura   Another difficulty was
that fluids could be run through these fine bore needles at a
reasonable rate only by means of increased pressure on the
piston of the syringe   This caused the anesthetic mixture to
be run into the spinal fluid in a fine high speed stream, and
made it difficult to deposit the mixture in the spinal fluid
quietly and without extensive mixing, as is sometimes desir
able   These difficulties were not at all serious, however, es-
pecially with anesthesia of such low level, and after a little
practice we experienced no real trouble

In order to give this method as severe a test as possible,
patients were gotten out of bed as soon after operation as was
practical   All of them sat steeply up in bed the afternoon of
operation and were out of bed the next morning   A number
of patients were out of bed the same afternoon and within a
few hours of operation

Among the forty one patients on whom this procedure was
used there were ten who had headache following anesthesia
and operation   These headaches were not severe enough to
cause complaint but were discovered only by direct question
ing   All but two of them occurred in patients who were sub
ject to frequent headache under ordinary conditions, all were
mild in type and all were transient and disappeared without
treatment or were readily relieved by simple measures   In no
instance was there either severe or prolonged headache of the
type which had previously occurred when the larger needles
were being used

While no definite conclusions can, of course, be drawn from
a series of cases as small as this one   yet it is certainly quite
suggestive that when 21 and 22 gauge needles were being used

Relaxation of the anal sphincter is profound This is important because, with such relaxation these operations may be performed with a minimum of trauma, and convalescence is therefore, more rapid and comfortable for the patient The same degree of relaxation is not reached with a general anesthetic, and is approached only at considerable depth, a depth which is likely to be followed by vomiting and general discomfort during recovery

There is practically no postoperative upset Nausea and vomiting are absent The patient's recovery depends entirely on the surgical condition It is not delayed or upset at all by the results of anesthesia

There is no danger of fire or explosion With inhalation anesthesia it is practically necessary to use cyclopropane or ether, usually the latter in order to get as much relaxation of the anal sphincter as possible This introduces a possible hazard in the use of the cautery with hemorrhoids

The one drawback to the use of spinal anesthesia has in the past been the frequency of post puncture headache The surgical disability following these operations is so slight that many patients may be out of bed the morning following operation and some may be up the afternoon following a morning's operation, if this is desired Under these circumstances headache frequently occurs No exact count was kept of the number of headaches in our cases but they are judged to have occurred in about one third or more Moreover, these headaches were severe They were not the mild ailment which yields readily to an ordinary analgesic They were severe and disabling In several instances headache continued unabated for a month or more and made the original surgical condition and the operation seem very trivial indeed by comparison

So frequent and severe were these headaches that we were on the point of abandoning this method of anesthesia entirely, but before doing this it was decided to see what the effect would be of using a fine spinal needle of 24 gauge instead of the 21 or 22 gauge needles which we were then using

THE TREATMENT OF PILONIDAL SINUS

NEIL W. SWINTON AND CLARE C. HODGE

PILONIDAL sinus has been the subject of considerable discussion since the lesion was first described by Warren in 1867 the term pilonidal sinus however was first used by Hodges in 1880 Discussion in the past has largely centered around the etiology of the condition and the most effective methods of treatment In the past ten years more than fifty articles on this subject have appeared in the literature [1] [2] [4] [6] [9] [10] [13]

It is not the purpose of this paper to review in detail or make additions to the discussion of the etiology of pilonidal sinuses During the past ten years 30 per cent of the eighty five patients with this condition who have come to us for treatment have previously had a radical excision and recurrence has taken place The incidence of recurrence has been reported in the literature as between 2 and 50 per cent These two facts indicate that the treatment of pilonidal sinuses has not been satisfactory and that further discussion of this phase of the subject seems indicated

In this paper the types of treatment that we have employed at the clinic for this condition and their results will be discussed and the plan of management that we have found to be most satisfactory will be presented

Two principal theories have been advanced as to the cause of pilonidal sinuses The neurogenic theory first advanced by Tourneaux and Herrmann in 1887 and more recently substantiated by Gage suggested that this condition originates in the unobliterated end of the medullary tube Stone believed that these sinuses are the result of an ectodermal invagination in the midline over the sacrococcygeal joint and he compared them to the preen glands of the fowl This theory explains the occurrence of the sinuses in the second and third decades

there were many severe and prolonged headaches, while when a 24 gauge needle was used there were no headaches of this type even though conditions were purposely made as trying as possible   Post puncture headache was changed from a major drawback to a mild annoyance

Summary—Sacral anesthesia by the spinal route in which 21 and 22 gauge spinal needles were employed was found to have many advantages for anal operations, but headaches following anesthesia proved so frequent and so severe that the method had to be abandoned   A series of forty one cases is presented in which a 24 gauge spinal needle was used   Several mild headaches occurred in individuals ordinarily subject to headache, but no severe headache occurred of the type previously produced

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pilonidal sinuses have been operated on and followed to the present time. The incidence of recurrence in the entire group was 18 7 per cent. Of these eighty five patients, thirty were operated on by means of excision followed by primary closure of the wound. There were five recurrences following this operation, an incidence of 16 6 per cent. The majority of surgeons have largely abandoned this method of treatment be
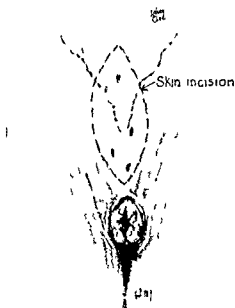
Fig 220 —Multiple sinuses near the midline over the sacrococcygeal joint which are usually seen in pilonidal sinus disease

cause of the universally high incidence of recurrence. It is very difficult to prevent contamination in the sacrococcygeal region following operation. Wound infections occur in many of these cases and the problem of recurrence will always be a hazard. The primary suture method has also been criticized because of the difficulty of completely obliterating all dead spaces at the time of operation, which is an important factor

of life when other secondary sex characteristics develop It is the consensus of opinion of all observers that this condition is the result of some disturbance of embryonic development

The diagnosis of pilonidal sinus is not difficult The patients are usually in the second and third decades of life In our series the ages varied from seventeen to fifty-eight years and the ratio of males to females is 3 1 The rarity of sinuses of this type in the negro has been reported and there were none in our series

Pilonidal sinuses are usually first noted by the occurrence of an abscess which frequently is initiated by trauma These abscesses originate in the midline over the sacrococcygeal joint Following the development of an abscess, incision and drainage of the region is done or there is spontaneous rupture of the infected area with the development of multiple sinus tracts Recurrence of abscess formation is common unless radical treatment is carried out and, in long standing cases, extensive sinus tracts will be found which may involve large areas of the low back region Communications with the spinal canal and the rectum have been reported The presence of multiple sinus tracts in the midline over the sacrococcygeal joint however, is almost always pathognomonic of pilonidal sinus (Fig 226)

Anal fistulas, presacral dermoids ischiorectal abscesses tuberculosis, carbuncles syphilis and osteomyelitis are the important conditions to be differentiated

It has been our policy at the clinic to make a diagnosis of pilonidal sinus in those individuals who have a typical history

ns
o
r
dinarily rules out anorectal fistula and tumors of the presacral space

In this group of patients three types of operations for the removal of pilonidal sinuses have been utilized Excision of the sinus region with primary closure of the wound block excision and transplantation of a pedicle flap (described from this clinic in 1929), and the simple type of block excision

In the past ten years, a total of eighty five patients with

pilonidal sinuses have been operated on and followed to the present time The incidence of recurrence in the entire group was 18 7 per cent Of these eighty five patients, thirty were operated on by means of excision followed by primary closure of the wound There were five recurrences following this operation, an incidence of 16 6 per cent The majority of surgeons have largely abandoned this method of treatment be
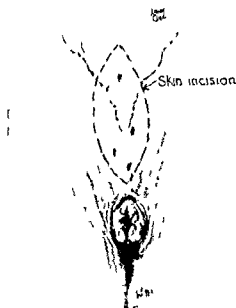
Fig 226—Multiple sinuses near the midline over the sacrococcygeal joint which are usually seen in pilonidal sinus disease

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in avoiding recurrence   Ferguson however, has perfected this method to a very high degree and reported an almost negligible incidence of recurrence at the present time

At the clinic we have largely abandoned this method and since 1934, have performed primary closure only thirteen times   In a few cases in which small sinus tracts are
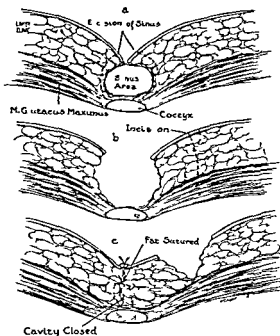
Fig 227—The pedicle flap operation described b D Lahey in 19 9 This operation has largely been abandoned for the routine t eatment of pa tients with pilonidal sinuses   It is useful however in a few selected cases

relatively free from infection and are confined to the midline primary closure of the excised wound may be justified

Lahey, in 1929 reported a method of transplanting a ped icle flap into the defect following block excision (Fig 227)

healing, and second, to decrease the amount of scar tissue directly over the sacrum, which was frequently subjected to irritation and trauma   Follow up data on twenty-three patients who were operated on in this manner indicate a recurrence incidence of 35 per cent   This is the highest incidence of recurrence of any method we have used and consequently we have abandoned its use for the routine case of pilonidal
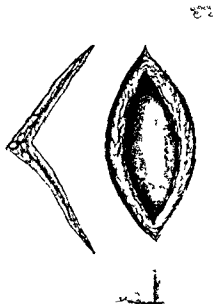
Fig 228 —The flap operation as employed at the present time Following simple block excision a V shaped excision is made in the buttocks lateral to the defect

sinus   In the past four years the flap operation has been done at the clinic only three times   The difficulty which we encountered with this procedure was the same as that in the group treated by primary closure, that is, infection   At the present time we believe that the flap operation as originally described is definitely indicated in a few cases in which previous attempts to eradicate the sinus region have failed due to the difficulty in eradicating dead space or excessive scar formation directly

over the coccyx Figs 228–230 demonstrate the flap operation as it is employed at present

The type of block excision with wound packing and resultant secondary healing which was originally employed had several objections The duration of healing invariably was long and the incidence of recurrence high Since 1934, however, we have operated on twenty nine patients by certain

Fig 229 The pedicle is attached at both ends to insure an adequate blood supply By undercutting the pedicle it can then be moved medially to fill in the defect overlying the lower sacrum and coccyx

modifications of this method with only one recurrence At present we employ a modified type of block excision for the majority of patients with pilonidal sinuses

Rogers[11][12] has emphasized a point which has been a common fault in the past in block excision of these sinus areas that is, a tendency to do too extensive an excision The majority of the sinus tracts are near the midline in the sacrococcygeal area and extensive block excision is not necessary

All the sinus tracts, and usually all scar tissue, must be removed to prevent recurrence, but if this is done by careful surgical dissection of the involved area, needless tissue will not be destroyed and the resultant defect will not be needlessly large In Figs 231, 232 the excision and exposure of the excised area are shown In the majority of our cases excision down to the fascia overlying the sacrum and coccyx was necessary

Fig 230 —Primary suture of the defect over the coccyx in many cases the lateral defect may also be closed primarily

The after care of these patients is of the utmost importance, since in the past, improper postoperative treatment has been the cause of the majority of recurrences

Operations at the clinic for pilonidal sinus are performed in the hospital Usually a low spinal or local anesthesia is employed Hospitalization of from two to three days is usually sufficient and, following discharge from the hospital, the patient is seen in the office twice each week until the wound is completely healed The gauze packing left in the wound

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at the time of operation is removed at the end of twenty four to thirty six hours and a very small piece of dry gauze, merely large enough to hold the wound edges apart, is reinserted When the patient returns for subsequent dressings, the area surrounding the wound edges is first carefully shaved

Delayed wound healing and recurrence have resulted especially in hairy individuals from overlying hair becoming
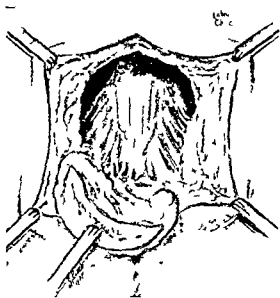
Fig 231—Block excision of sinus tracts and scar tissue The dissection is carried down in this case to the fascia overlying the sacrum and coccyx This is not always necessary

imbedded in granulation tissue Particularly at the time of the first few dressings, a modified Carnoy's solution (absolute alcohol 6 cc , chloroform, 3 cc glacial acetic acid 1 cc , and ferric chloride, 1 gm) is placed in the wound and the wound swabbed with alcohol The wound is carefully examined for any remaining sinus tissue and gently curetted removing such tissue A small dry gauze sponge is then reinserted superficially into the wound These patients are encouraged to take

sitz baths twice daily at home between dressings, beginning within a few days of operation Baths of this nature are of great assistance in keeping the surrounding skin clean and in keeping it from becoming macerated, and the elimination of odors and general discomfort gives the patient considerable moral assistance in the treatment of his condition
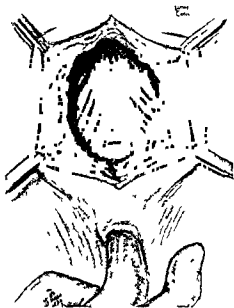
Fig 232 —Completed block excision A finger inserted in the rectum at this point outlines the rectum and its relation to the defect Scar tissue and sinuses at the lower angle of the wound which might otherwise not be detected can often be palpated in this manner

The duration of healing of wounds treated in this manner has always been long In our last series of twenty nine cases, healing took sixteen weeks in twenty-one cases, and in the remainder up to one year to heal completely We believe that this time can be still further reduced

Summary —The cases of 85 patients with pilonidal sinuses who were treated and followed during the past ten years, are

reported The etiology and diagnosis of this condition are briefly mentioned The three types of treatment that have been employed in this series of cases are discussed with the results of each A modified type of block excision is discussed in detail as the plan of treatment which in our hands has given the most satisfactory results

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KNEE JOINT ARTHROTOMY FOR REMOVAL OF A SEMI-
LUNAR CARTILAGE: TECHNIC OF THE LATERAL AND
ANTERIOR INCISIONS

G E HAGGART AND JAMES W TOUMEY

To avoid confusion, the plan of the operation described below is directed toward removal of the internal semilunar cartilage, since this particular meniscus is a more frequent cause of internal derangement of the knee than is the lateral semilunar cartilage. However it is obvious that the same type of incision, but on the opposite side of the knee, can also be employed for removal of the external meniscus

The anterior incision for removal of the internal semilunar cartilage as popularized by Sir Robert Jones is perhaps the more commonly employed route but the incision on the medial lateral aspect of the knee is the preferred approach if the clinical history and subsequent examination indicate that there is probably an injury to the posterior half of the cartilage, in which event it is desirable to remove the entire meniscus rather than its anterior two thirds By means of this incision the lateral and medial lateral ligaments of the knee are under direct observation and are not injured We believe it is particularly important to preserve these ligaments intact

The operation is done under a tourniquet, and in this connection the following plan devised by one of us (J W T) has been particularly effective in preventing any nerve or circulatory complications following operation After induction of anesthesia preferably spinal an assistant holds the leg elevated at angle of 70 degrees hip flexion with the knee extended for a period of five minutes Then an Esmarch bandage is applied to the extremity beginning at the toes, and is tightly wound in successive layers up the leg to the level at which the tourniquet is to be applied With the latter snugly in place,

reported The etiology and diagnosis of this condition are briefly mentioned The three types of treatment that have been employed in this series of cases are discussed with the results of each A modified type of block excision is discussed in detail as the plan of treatment which in our hands has given the most satisfactory results

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tibia as well as to inspect the external semilunar cartilage
Freeing the meniscus from the synovial membrane back to the
line of the lateral ligament is most simply performed by a thin
sharp bladed knife and the dissection is thereafter continued
posteriorly with the same instrument until the posterior third
or quarter of the body of the cartilage is reached   At this
point the special knife (Fig 235) is employed which makes it
possible to free the cartilage further posteriorly and then divide
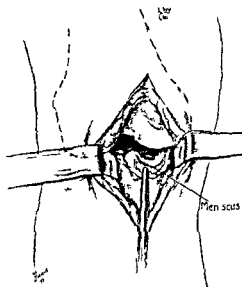
Fig 234.—The anterior incision showing completed dissection of anterior half
of cartilage

it so that a minimum of three quarters of the semilunar car
tilage is removed

An important adjunct to hemostasis of vessels of any size
*that may be severed in the course of the intra articular part
of the operation* is the use of the small metal sucker covered
with thin rubber tubing except at its tip   Excess fluid can
thus be easily removed and a coagulating current applied to a
point well within the joint which otherwise cannot be reached

The wound is now closed in layers—the synovial membrane

the Esmarch bandage is removed, the preoperative sterile dress
ing taken off, and the leg prepared for operation in the usual
manner   By this step the extremity is completely emptied of
blood up to the level where the tourniquet is applied, and as
a result, the operative field is really dry and postoperative com
plications from use of the tourniquet have been absent

The vertical anteromedial incision for removal of the in
ternal semilunar cartilage averages 4 inches in length and is
placed approximately halfway between the medial border of
the patella and the medial lateral ligament (Fig 233, a and b)
The skin and subcutaneous tissue are divided together, then
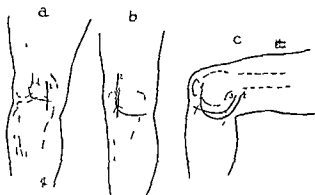
F g 233—Anterior and lateral incisions for removal of internal semilunar
cartilage   The same types of incision are equally applicable to the external
aspect of the knee   Anterior incision 1 and 2 (Kocher)   lateral incisions 3
(Cave) and 4 (Timbrell Fisher)

the capsule, and finally the synovial membrane is picked up
with two pairs of forceps and incised and the opening in this
layer completed with scissors   With the aid of a long, rela
tively wide, smooth retractor, the fat pad is retracted forward
and out of the way and so permits adequate visualization of
the anterior attachment of the meniscus   The latter is then

MEDIAL LATERAL INCISION FOR REMOVAL OF THE INTERNAL
SEMILUNAR CARTILAGE

As previously noted, this incision is particularly helpful
when it is considered essential to remove the entire cartilage
because of damage to the posterior portion of the meniscus
This incision does not permit as adequate exploration of the
joint as a whole, especially the anterior compartment, as is
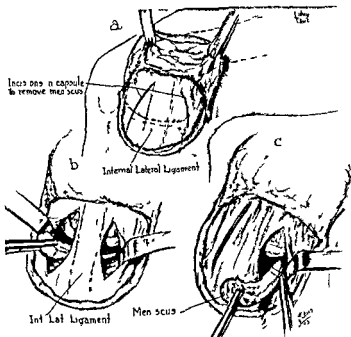
Fig 236—The lateral incision (Timbrell Fisher) The internal lateral liga-
ment is preserved while the entire semilunar cartilage is removed

secured through the anterior incision, but it makes removal of
the entire meniscus a much simpler proceeding than by means
of the anterior route Knowledge of this incision was first ob
tained from the papers by Timbrell Fisher who described a
' U ' shaped incision on the medial aspect of the joint (Fig
233, c) A modification of this incision, somewhat resembling
a hockey stick with the convexity forward, is also described by

with interrupted fine chromic, the capsule with interrupted silk the subcutaneous tissue with interrupted plain catgut, and the skin with silk A compression dressing is applied and then the tourniquet is removed Splints are not utilized Usually these

Fig 235—Special knife right and left for removal of posterior part of meniscus The shank *a* is not tempered and therefore can be curved by the angle iron shown to fit the contour of the femoral condyle The knife is particularly useful in the anterior incision

patients start combined active and gentle passive motion of the knee within forty-eight hours after operation If a large amount of fluid accumulates in the knee after operation it can be aspirated as indicated As a rule this is not necessary

THE TREATMENT OF MALUNITED POTT'S FRACTURES BY: (1) ARTHRODESIS OF THE ANKLE JOINT; (2) BIMALLEOLAR OSTEOTOMY

James W. Toumey and G E Haggart

ARTHRODESIS OF THE ANKLE JOINT

Permanent disability, in the form of pain and consequent limitation of weight bearing, following fractures about the ankle joint is well known to physicians who are called upon to treat it Even in cases in which excellent reduction has been accomplished and in which after-care has been adequate, degenerative changes have taken place at the ankle joint which result in serious limitation of activity These individuals are commonly treated by a long course of physiotherapy such as massage, exercises and diathermy Frequently these measures fail to relieve the symptoms These patients optimistically believe as months elapse following injury that the pain will finally subside and that walking will become less difficult In many of these cases, the symptoms increase as time goes on

The fractures in which good end results are not obtained are, first, those in which the traumatism, displacement, and comminution are great and in which a satisfactory reduction cannot be or is not obtained In these there is obvious mechanical interference with function Second, there are the fractures without marked bony abnormalities but which have a disruption and widening of the ankle mortice Third, the fractures which have resulted in varus or in a valgus position of the heel are frequently attended with pain Fourth, are the cases in which a degenerative arthritis results, ending in a productive reaction at the ankle joint which produces increased pain and limitation of motion

Patients who have persistent pain following fracture in the region of the ankle joint which has not yielded to conservative

Cave (Fig 233, c)   Finally, there is the reverse of this last named incision, that of Kocher which runs down the inside of the rectus femoris to below the patella and there turns posteriorly (Fig 233, b)

The skin and subcutaneous fascia are reflected as one flap and lifted proximally, exposing the capsule (Fig 236, a)   The knee joint is exposed through two incisions, the first passing obliquely from above downward and forward between the internal lateral ligament and the anterior midline of the knee while a second incision directed posteriorly is made behind the lateral ligament (Fig 236, a)   Through the first named incision the anterior half of the internal semilunar cartilage is mobilized (Fig 236, b), and then, having been dissected free from the medial lateral ligament, the cartilage is passed behind this ligament and out again through the posterior incision in the capsule and synovial membrane, through which removal of the entire meniscus is completed (Fig 236, c)

Thus, by means of this approach, the internal lateral ligament is preserved, and it is possible to explore the medial anterior and posterior compartment completely and so remove the entire semilunar cartilage   Closure of these wounds is exactly as described above and the postoperative treatment is the same

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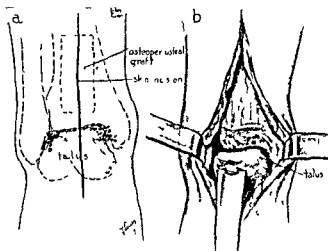
Fig 237 —a, Arthrodesis of ankle joint Diagram of technic   b, Arthrodesis of ankle   Removal of articular surface of talus with osteotome
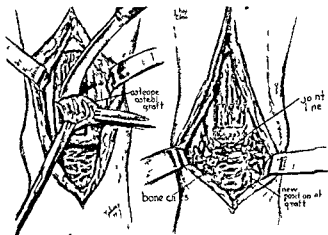
Fig 238 —Arthrodesis of ankle   Cutting osteoperiosteal graft from tibia   Final position of chips and graft

The talus must be maintained in close contact with the tibia either by dorsiflexing the foot or by extending the plaster above the partially flexed knee with pressure applied beneath

measures such as physiotherapy and properly fitting shoes and arches, are candidates for operative intervention unless there are special contraindications. Arthrodesis of the ankle joint is the procedure of choice except in the special group which can be relieved by bimalleolar osteotomy. We feel that in most cases one year should elapse from the time of injury before operation is undertaken. However, in cases in which malunion and nonunion are so marked that it is hopeless to expect painless function, much disability and pain can be avoided by earlier operation. No arbitrary age limit can be set for ankle fusion. It is true that young adults achieve a better functioning foot than older individuals do because the lack of motion in the ankle joint itself is compensated for in a surprising degree by increased range of motion in the subtalar joints.

The incision for arthrodesis of the ankle is made longitudinally anterior to the lower tibia and just lateral to the dorsalis pedis artery and anterior tibial nerve which are retracted medially while the long extensor tendons are drawn to the lateral side. The incision is extended downward to the neck of the talus.

A tourniquet is used as a dry wound makes the procedure much simpler. The ankle joint capsule and synovial membrane are incised longitudinally. The synovial layer is regularly found to be inflamed with pannus encroaching upon the articular surfaces. In later cases marginal arthritic proliferation are present. The capsule of the ankle joint is widely reflected from the anterior tibia and talus by subperiosteal dissection and the articular cartilage is completely removed from all bony surfaces of the ankle joint including the articulating portions of the medial malleolus and the fibula (Figs 237 238). If the position of the talus is faulty it is then corrected it is especially important to correct a varus deformity. All bony surfaces are then roughened or fish scaled with chisel or gouge. An osteoperiosteal graft and additional bone chips are removed from the anterior tibia above the ankle joint. The bone chips are wedged into the gaps between the inner surfaces of the malleoli and the sides of the talus and the osteoperiosteal graft bridges the front of the ankle joint. The wound is then closed and a circular plaster cast is applied
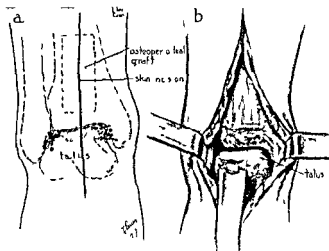
Fig 237—*a*, Arthrodesis of ankle joint Diagram of technic *b*, Arthrodesis of ankle Removal of articular surface of talus with osteotome
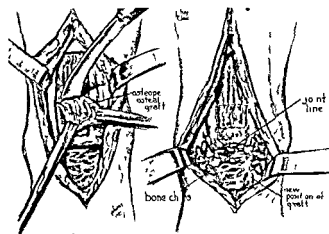
Fig 238—Arthrodesis of ankle Cutting osteoperiosteal graft from tibia Final position of chips and graft

The talus must be maintained in close contact with the tibia either by dorsiflexing the foot or by extending the plaster above the partially flexed knee with pressure applied beneath

the heel to maintain the talus firmly in the mortice It is very important to secure the correct amount of dorsiflexion as excessive equinus or calcaneous may result in an awkward gait Dorsiflexion of the foot to 90 degrees in males and 95 degrees (slight equinus) in females is advocated

The postoperative management is as follows The original cast is removed two weeks after operation and a snugly fitting boot is applied This is worn without weight bearing until six weeks have elapsed from the time of operation Walking is then begun with the patient wearing a plaster cast which is kept on for four weeks At the end of this period the plaster is removed and the extent of fusion is checked by roentgenologic examination When fusion is present, walking without plaster is started the patient wearing an arch

BIMALLEOLAR OSTEOTOMY

The valgus type of deformity with lateral displacement of the foot on the tibia is common and is due to the eversion fracture involving the medial malleolus and the fibula usually about 2 inches above its lower end The foot is displaced laterally and with the talus go both malleoli Often a correct anatomic reduction is not secured in this fracture, and the valgus deformity frequently associated with external rotation of the foot becomes permanent

Bimalleolar osteotomy[3] may produce an excellent result even in cases in which this deformity has been present for several years In this procedure ankle joint motion is preserved and this is the obvious advantage over arthrodesis Bimalleolar osteotomy is contraindicated if arthritis is present at the ankle joint or if the main weight bearing articular surfaces of the tibia and talus are uneven (Figs 239 240) The

line of fracture The fibular osteotomy is made obliquely at the point of fracture The talus is then returned to its correct position and the position of the osteotomy fragments is controlled if necessary with silk sutures passing through drill holes in the bones

The ankle is immobilized after operation by a circular plaster cast extending from the toes to the knee Six weeks after operation a closely fitting plaster boot with a walking iron is applied and weight bearing is started This second cast is usually left on for four weeks Walking without the plaster cast is then permitted

Fig 239   Fig 240
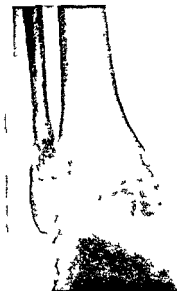
F g 239—B malleolar fracture with lateral displacement of talus three months after injury

F g 240—Prev ous fracture four months after bimalleolar o teotomy Three months after injury both fracture l nes were osteotomized The in ternal malleolus was sutured to the t bia w th silk through dr ll holes in the bone

Old fractures of this type are frequently associated with fixed equinus deformities which may be corrected at the same procedure by calcaneus tendon lengthening

We feel that these procedures offer much to a group of partially disabled patients who are often neglected These procedures are even more frequently applicable and more successful than subtalar arthrodesis (of the talocalcaneal talo

navicular, and calcaneocuboid joints), which is indicated in cases of residually painful fractures of the calcaneus

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THE SURGICAL CORRECTION OF HALLUX VALGUS WITH DORSAL AND MEDIAL EXOSTOSES

G E HAGGART AND JAMES W TOUMEY

THE type of hallux valgus under discussion is that represented by a pronounced, painful deformity of the great toe with resultant disability which is not amenable to conservative treatment (Fig 241, *a*) Together with an appreciable valgus displacement of the toe, a large deforming exostosis is evident both on the medial and dorsal aspects of the metatarsal phalangeal joint, limitation of dorsiflexion of the toe at this joint may be quite pronounced, while the entire forefoot is markedly relaxed and flat We have had the opportunity to employ many of the numerous operations advocated for correcting this condition, and it is our opinion that the procedure originally described by Keller has given the most satisfactory results All of these operations must be supplemented by intensive foot exercises and the wearing of corrective shoes

When a patient with painful feet primarily related to valgus deformity of the great toe is first seen, there is consistently present a chronic low grade cellulitis in the soft parts overlying the medial exostosis and over the dorsal one as well if it is unduly prominent Especially is there an inflammation of the bursa which is found over the medial exostosis It is extremely important to eliminate all this inflammation before open operation is carried out, otherwise, disaster in the form of infection may result Consequently, the first instructions to such a patient are to remain at home off the feet for a period of seven to ten days In this interval ordinary shoes are not worn but rather sandals, with a strap passing between the first and second toes or shoes cut out over the forefoot The feet are soaked in hot salt water three times a day, followed by

navicular, and calcaneocuboid joints), which is indicated in cases of residually painful fractures of the calcaneus

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3 Speed, J S and Boyd, H B   Operative reconstruction of malunited fractures about the ankle joint Jour Bone and Joint Surg , 18 270–286 (April) 1936
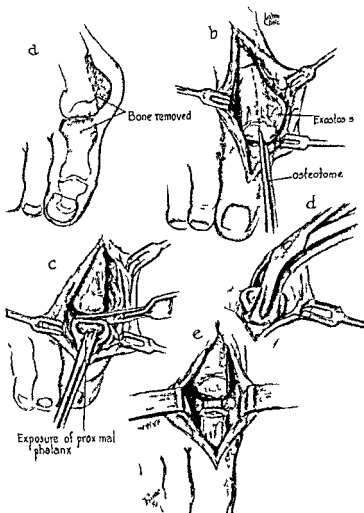
Fig 241 —Keller operation for hallux valgus   Only medial exostosis is shown   Note transverse cortical incision in metatarsal shaft just proximal to exostosis which prevents splintering of this bone   In *c*, the knife is exposing bone of the phalanx

tissue by sharp dissection (Fig 241, *c*)   Particular care is taken to preserve the underlying flexor tendon   This technic is preferable to the use of a periosteal elevator as, with the

active muscle exercises for the leg and foot. The patient then should return with no further evidence of inflammation as admitted to the hospital and given the usual twenty four hour preparation for operation. This comprises further hot foot baths, scrubbing the feet with soap and water, and shaving as necessary

Operations have been done both with and without tourniquets. Inasmuch as the majority of our patients have been in the older age group and because the coagulating current is utilized for bleeding vessels, it is now our custom to perform these operations without the tourniquet

The incision extends from just proximal to the first interphalangeal joint of the great toe on the dorsomedial aspect of the foot to the midpoint of the metatarsal shaft (Fig 241 b) and is deepened directly to the bone. The skin and underlying superficial and deep fascia are thus reflected as one flap, an important point inasmuch as the nutrition of the skin is thereby preserved and there is much less chance for necrosis. The bursa is dissected off the exostosis and if there is marked valgus deformity of the toe, a wedge-shaped piece of this tissue is excised so that later approximation will hold the toe in the correct position. The joint opened, the exostosis is now removed by a straight thin wide blade osteotome as shown in Fig 241 b. Note that the cortex of the metatarsal has been cut transversely just proximal to the exostosis so there is no possibility of removing an unduly large fragment of the cortex from the middle third of the metatarsal shaft. Care must be taken that the exostosis is squarely removed in line with the medial border of the foot. Any dorsal exostosis on the metatarsal head is similarly treated. The weight bearing portion of the metatarsal head is not disturbed

The next step is removal of the proximal half of the phalanx. Originally only the base and adjacent portion of the shaft of the phalanx were cut away but this is not enough as

rective shoes   He is thereupon discharged from the hospital to continue the regimen of muscle exercises and further walking at home

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periosteum left behind, resultant bone proliferation may obstruct function of the toe By this step the adductor hallucis oblique muscle on the plantar surface of the foot is severed from its insertion into the phalanx If desired, the technic of McBride can here be utilized, and the tendon of this muscle reinserted into the distal lateral aspect of the metatarsal shaft On the whole we have not found this step essential When a sufficient amount of the shaft of the phalanx has been exposed, it is then cleanly removed by heavy, bone biting forceps (Fig 241, d) which is preferable to an osteotome as there is much less chance of damaging the underlying flexor tendon

When first performing this operation, a flap of fascia or a part of the capsule was turned in over the base of the phalanx This has not been found necessary in subsequent cases and therefore has been omitted, thus saving an appreciable amount of time and yet still obtaining very satisfactory function because the soft tissues collapse around the cut end of the phalanx and so protect the cartilaginous head of the metatarsal from the raw bone surface of the phalanx

The toe is now aligned with the foot and, if there was marked valgus deformity, correction is maintained by a plastic on the lateral aspect of the capsule, and the overlying soft tissue A minimal amount of catgut is utilized to close the wound, the skin is approximated with interrupted silk, and a simple gauze dressing is applied holding the toe in the correct position The latter may be further insured by the use of adhesive straps running from over the end of the toe along the medial side of the foot

Postoperative Care —In the average case, sutures are removed on the eighth or ninth day after operation Patients are urged to resume active muscle exercises as rapidly as possible Weight bearing is permitted at the end of the second or in the third week under the following conditions The patient brings into the hospital a pair of old oxford shoes and the leather is cut out over the site of the operative incision This permits room for the dressing over the wound and yet during weight bearing, the foot as a whole is supported in a shoe to which the patient is accustomed The patient progressively increases weight bearing activities until, at the end of three weeks following operation, he can usually be fitted with cor

TECHNICAL STEPS IN THE REMOVAL OF CERTAIN MENINGIOMAS OF THE CEREBRAL CONVEXITIES

GILBERT HORRAX

It is now fairly common knowledge that cerebral meningiomas or dural endotheliomas form one of the most favorable groups of brain tumors capable of complete removal They are benign encapsulated growths and, in the majority of instances are attached to the dura over one or the other cerebral convexity, sometimes having no close relation to the large venous sinuses but perhaps more often lying near or even invading one of these structures The extirpation of meningiomas may at times be relatively simple but the technical difficulties are generally increased by the great and unusual vascularity of all the tissues surrounding the tumor This is particularly true of the bone overlying the growth as well as the dura not only in its vicinity, but over the whole hemisphere Not infrequently a bony enostosis may be shown by the x ray at the attachment of tumor to dura, and this enostosis may be so embedded in the dura and underlying growth as to cause certain difficulties unless precautions are taken Other difficulties are encountered when meningiomas arise from the edge of longitudinal sinus

It is because of some differences in the technic of approaching these tumors according to their situation and attachment that examples of three of the commoner types are here described in considerable detail

Before launching into technical descriptions, however, there are certain general principles which should be stated briefly Knowing that considerable loss of blood may be inevitable, the patient should be started on an intravenous saline drip as soon as he is under the anesthetic This drip is kept going throughout the operation, and if transfusion becomes necessary, it can

struments inserted at its upper margin, it should be quickly but
as gently as possible broken across at the thin temporal pedicle
and the highly vascular dura covered immediately with a large
piece of cotton moistened in warm normal saline   It will be
noted that the dura immediately overlying the meningioma
shows a fine injection with small blood vessels (Fig 242, a)
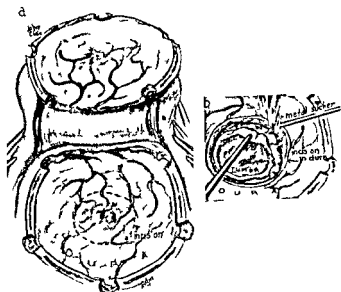
Fig 242—a Bone flap elevated over tumor showing general vascularity
of bone and dura as well as localized vascularity at site of tumor   Incision
in dura around tumor is indicated by dotted line   b Incision around tumor
completed with beginning separation of tumor from cortex   Clips are on
dural vessels   Vessels entering tumor are coagulated at end of metal suction
tube

Any further bleeding from bone may now be completely
stopped with wax and if a large meningeal artery has been
partly torn in the bone it may likewise be held up temporarily
with wax until the artery can be ligated with a silver clip,
perhaps after taking off a little more bone over it with the
rongeurs   The smaller, surface meningeal vessels venous or
arterial can now be coagulated with the electrosurgical appa

be given easily and quickly by taking blood from a donor who should always be immediately available When x rays indicate a particularly vascular field, two donors should be ready An other wise precaution is to have some muscle at hand either from another patient undergoing operation at the same time or failing this, from the patient's own temporal muscle or from the tibialis anticus   In rare instances when the dural and extracranial vascularity seems excessive, it may be wise to per form preliminary ligation of the external carotid in the neck

So far as anesthesia is concerned, it is our present custom to use avertin supplemented by intratracheal ether, in addition the scalp incision is infiltrated with 1 per cent novocain to which is added 4–6 drops of a 1 1000 solution of adrenalin per ounce   If highly trained anesthetists are not available it would doubtless be wiser to carry through operations of this kind under local anesthesia with repeated small hypodermics of morphia

1 MENINGIOMAS OVER CEREBRAL CONVEXITIES NOT ATTACHED TO LONGITUDINAL SINUS AND HAVING NO APPRECIABLE BONY ENOSTOSIS INCORPORATED IN THEIR ATTACHMENT

These are obviously the least difficult of all the meningiomas to remove   Even so the vascularity of scalp and bone may be excessive and it is hardly necessary to say that all possible measures should be used to prevent blood loss   For the scalp the fingers of assistants pressed firmly on either side of the line of incision with a slight pull away from the line as advocated for years by Cushing is unquestionably the method of choice

A good sized bone flap is outlined with its center over the known area of tumor and its pedicle in the temporal region where bone is thin (Fig 246 a)   Details for making and turning down the ordinary flap of this type are not necessary here   for these reference may be had to Nelson s Loose Leaf System of Surgery [1]   Bleeding from the bone both at the burr openings and from the incisions cut by the Gigli saw may require large amounts of bone wax   plenty should therefore be on hand and placed quickly along the bony cuts and in the burr holes by assistants or the operator

When the bone flap is elevated by lifting it with suitable in

ing length of time, according to how large or how lobulated a
tumor may be or according to how difficult it is to see and
control the vessels running between it and the brain especially
when working at a great depth below the surface In rare
instances when dealing with the angioblastic types of growth
it may become necessary to insert a finger and make a quick
enucleation in order to be able to get at a place from which
hemorrhage could not be controlled during enucleation by the
other method Ordinarily the finger method entails unneces
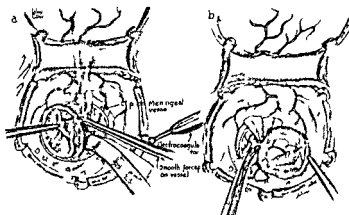
Fig 243—a Further steps in enucleation of tumor The growth is lifted
outward using its firm dural attachment as a handle Entering vessels are co
agulated by grasping them with smooth forceps to which the electric current is
applied b Final steps in enucleation The tumor is tilted outward by forceps
grasping its dural attachment A silver clip is placed on entering artery
Cotton pledgets which have been placed between tumor and cortex during
enucleation are shown protecting brain from damage

sary trauma to the brain and causes much greater subsequent
edema Likewise nodules of growth may be broken off and
remain undiscovered if this method is used Another maneuver
which at times may be indicated is to excavate growth partially
with the electrosurgical loop in order to reduce its size, thus
facilitating its subsequent delivery with less trauma to sur
rounding brain tissue

After the tumor has been extirpated, the cotton strips are
removed from the cavity and all oozing points are controlled

ratus   An excellent means of doing this is by having the current run along a metal suction tube so that there is maximum drying of the point to be coagulated at the moment coagulation is applied   This simple device was instituted on our neurosurgical service by Dr Heyl, who has made a note about it for publication [2]   All this time the bleeding area over the tumor attachment on the dura should be kept controlled by pressure with moist cotton or by a good sized piece of muscle if vascularity is excessive

When bleeding from the various mentioned sources is under reasonable control, the next step is to incise the dura around the margin of underlying tumor   If the tumor edge cannot be palpated through the dura, an incision can be made in the latter running toward growth, and when the edge is seen, the dural incision can then be carried around it until it is completely encircled, meningeal vessels being either ligated with silver clips or coagulated (Fig 242, b)   The dural attachment of the tumor can now be grasped with a forceps and, by lifting gently, a start can be made in separating the growth from the cortex after the arachnoid and such vessels as there are passing from cortex to tumor around its surface margin have been coagulated and divided (Fig 242, b)   When such a start has been made a smooth spatula should be carefully inserted between tumor and brain, retracting the latter very delicately, while another spatula, manipulated by an assistant is placed opposite and retracts the tumor away from the brain   As this dissection is carried downward, a flat pledget of cotton attached to a silk thread, or a long strip of dental cotton, should be inserted to protect the brain surface from trauma (Fig 243, a)   When this maneuver has been accomplished in one area, the spatulae are moved around the edge of growth and the same thing is done again   In this way one works around tumor on all sides going a little deeper each time around and coagulating or clipping any entering vessels as they are seen   At all stages the underlying brain is kept covered with flat cotton strips, and gradually the tumor will begin to deliver and can be tilted out completely   There are usually some large vessels at the bottom which must be clipped before the growth is lifted out (Fig 243 b)

Extirpation in the manner just described may take a very

very simply by taking a graft of appropriate size from the area where the bone was separated from its scalp and periosteal attachment This procedure is well illustrated in Fig 244, *a* and *b* and needs no further comment

If considerable edema of the brain has resulted from the unavoidable contusion during removal of the tumor, it may be necessary to leave a decompression This is accomplished by removing bone in the temporal region with rongeurs and opening the dura under this area by stellate incisions

The final step in the operation is the accurate replacement of the osteoplastic flap, followed by careful closure of galea as well as skin with interrupted fine silk sutures Before this is done, however, the inner aspect of bone overlying the tumor should be burred out and thus destroyed if it is roughened from invasion by tumor cells

II MENINGIOMAS WITH MARKED BONY ENOSTOSIS ADHERENT TO AND INCORPORATED IN DURAL ATTACHMENT

When the x ray shows a considerable bony enostosis projecting into the dural attachment of the tumor there are certain precautionary measures which may be taken in regard to reflecting the bone flap The latter is outlined as usual over the growth, but is not turned up as a whole Instead, the scalp is peeled away from the surface of bone until the vascular area lying over the tumor can be seen completely (Fig 246, *b*) Several burr holes are made around this area and these are connected by Montenovesi forceps The remaining portion of the flap is then broken up leaving this adherent piece of bone in place on the dura (Fig 245, *a*) It is now much easier to lift the edge of this small bony island and separate its under surface from the adherent enostosis (Fig 245, *b*) than it would have been to do this separation from beneath the whole flap Indeed the latter maneuver may sometimes be so difficult that vessels from the cortex may be pulled upon and badly torn, with resulting severe hemorrhage or cortical damage The appearance of this type of growth in cross section is shown in Fig 245 *c*

The bony area over the tumor which has been taken out as described is not replaced after operation since it contains tu

completely, either by coagulation or by the use of silver clips
Occasionally a small bit of muscle may be helpful, but in any
case, hemostasis must be carried out with painstaking care
until the field is absolutely dry. Similar care should be taken
with the dural surface as well as with the muscle and under
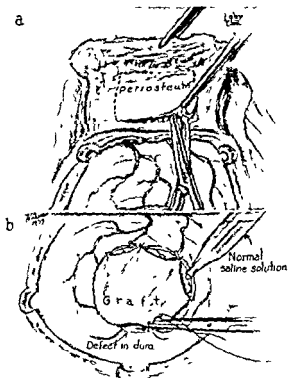
Fig 244—*a* Graft of periosteum outlined and removed from under surface
of bone flap *b*, The graft partially sutured over dural defect at site of tumor
removal Cavity being filled with normal saline solution

surface of the bone flap To control the latter the muscle and
periosteal attachment may be stripped away to a considerable
extent. As a final step before replacing the bone flap we are
now accustomed to repair the dural defect resulting from the
removal of the tumor by a graft of periosteum This is done
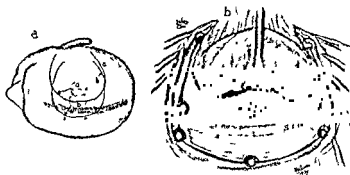
Fig 246—a Outlines of skin incisions for tumors over convexity (a) tumor well away from superior longitudinal sinus (b) tumor attached to sinus b, Skin flap peeled away from bone to show localized vascularity over site of tumor (arrow) Situation of burr holes for tumors attached to sinus
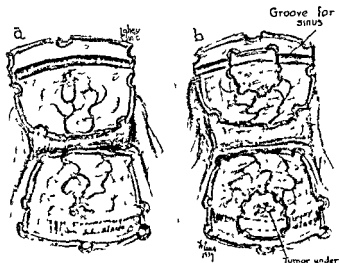
Fig 247—a, Bone flap elevated, including area across sinus The two burr holes on either side of the sinus anteriorly and posteriorly are connected with cutting forceps not by the Gigli saw b, Bone flap elevated leaving island of bone over tumor and contiguous sinus when considerable adherence exists This island is now more easily separated from dura and sinus
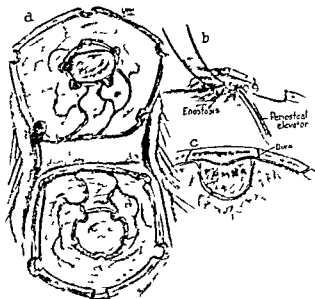
Fig 245—*a*, Bone flap elevated leaving island of bone over site of tumor
Burr holes have been made around the island and connected by Montenovesi
forceps. *b*, Edge of bony island lifted and adherent dura being scraped away
from tumor by sharp periosteal elevator *c* Cross section of tumor with adherent enostosis

mor cells   The remainder of the tumor enucleation proceeds
as detailed in Group I

III. MENINGIOMAS HAVING THEIR ATTACHMENT ALONG THE SUPERIOR LONGITUDINAL SINUS

It is obvious that tumors in this category present greater
difficulties in their removal than those which are situated well
away from the sinus The general principles, however, remain
the same

So far as the bone flap is concerned, it is now our custom
to outline the skin flap well across the sinus (Fig 246, *a*),
bone over the
the latter as
One of several

bone wax, and for the latter moist cotton or muscle, are used
for control

The dural incision is next made around the margin of the
tumor up to the edge of the sinus anteriorly and posteriorly
(Fig 249, *a*) The growth is then separated from the cortex
as in the manner described for Group I This separation, how-
ever, can only be accomplished around that part of tumor not
attached to the sinus When separation has been carried as
far as possible, the tumor should be tilted out, allowing it to
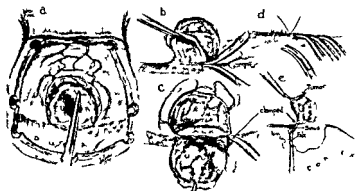
Fig 249—*a* Tumor attached to sinus Dura incised around growth up
to sinus margin anteriorly and posteriorly Tumor margin partially separated
from cortex *b* and *c* Tumor being tilted out hinging on sinus Curved clamp
on latter preparatory to final incision to free tumor completely *d* Curved
clamps along sinus margin removed one by one and their places taken by
silk sutures or silver clips *e* Cross section to show relationship of tumor to
sinus falx and cortex

hinge along its sinus attachment (Fig 249 *b* and *c*) To free
it from this, a series of curved clamps are placed one by one
along the sinus margin, and the dura is incised bit by bit as
each clamp is placed This leaves a group of curved clamps
holding the sinus closed These can be removed, one by one
in the reverse order from that in which they were placed, put-
ting at the site of each clamp a silk stitch or a silver clip (Fig
249, *d*) A cross section of this type of meningioma with its
relationships is shown in Fig 249 *e*

It remains only to be said that the removal of any menin-

courses is now open to the operator These technical proced
ures have been described in detail by my associate, Dr Poppen[3]
If vascularity and adherence do not seem too great, the whole
flap including that portion across the sinus, may be turned up
as in Fig 247 a If it seems wise to leave the bony area over
the tumor in order that this may be removed more easily and
with greater safety after the remaining bone has been elevated
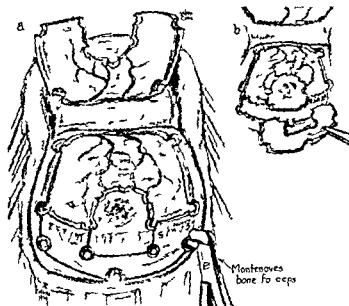
Fig 248.—a Method of elevating lower part of bone flap leaving bony
island over tumor and area of bone across sinus to be taken out separately
b Removal of bone across sinus in one piece to be replaced at end of operation

burr holes may be made around it on either side of sinus and
these burr holes connected with cutting forceps (Fig 247 b)
Or finally if there is excessive vascularity it may be wise to
elevate the lower portion of bone and then remove the area

ENCEPHALOGRAPHY—A PRACTICAL TECHNIC

James L. Poppen

Many methods are used for the introduction of air or oxygen into the cerebrospinal subarachnoid spaces Some of these are complicated by cumbersome apparatus As in all types of surgery, the least complicated method to execute a desired procedure is preferable It is therefore the purpose here to present a method that is simple yet practical Even though this method is simple to execute technically, I do not wish to convey the idea, however, that it should be undertaken by anyone who feels inclined to make an air study Emphasis should be placed on the fact that this procedure should not be carried out by anyone who does not realize the dangers associated with it, and it should preferably be done in surroundings where facilities are available for immediate intracranial operation if necessary

In our early experiences with encephalography it was the practice to carry out the air injection by the spinal route under local anesthesia and moderately heavy premedication, including morphine and barbiturates This proved to be so unsatisfactory from the standpoint of both surgeon and patient, because of severe reactions such as headaches, nausea, vomiting and vasomotor changes, that other types of anesthesia were necessary Avertin given by rectum was thought to be satisfactory for a while It was given with the patient in the supine position on the x ray table As soon as the enema had been given, the patient was placed in a sitting position and while he was still awake and cooperative, the spinal needles were inserted in the lumbar subarachnoid space Usually by the time this had been carried out the patient was asleep and the procedure could be carried out It was found that if the patient was allowed to go to sleep from the avertin before the spinal

glioma may present extraordinary difficulties even for the experienced neurosurgeon Occasionally it may seem wise to divide the operation into two stages, but almost always it is possible and preferable to do the extirpation at a single session The meticulous dressing and after care of these patients is a matter of the first importance, but does not fall within the scope of this article

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3 Poppen J L   Parasagittal meningiomas Operative technique suggested for their exposure Surg Gynec and Obst (In press)

The anesthetist makes use of the vein most convenient for the introduction of pentothal During this time the surgeon prepares himself by putting on a pair of sterile gloves and arranging the sterile material The latter has been transported from the operating room to the x ray department on a tray, and includes a basin of 70 per cent alcohol, sponges, several towels, a graduated container, test tubes, two spinal puncture needles (18 gauge), manometer, 20 cc syringe, and a small syringe and needle

As soon as the patient is asleep which usually takes from twenty to thirty seconds from the time the injection is begun the skin in the lumbar region is sterilized with alcohol One spinal needle is inserted into the subarachnoid space at the third and fourth lumbar interspace and another in the fourth and fifth lumbar interspace Each needle is introduced either up to the ligamentum subflavum or just through the intra spinous ligament The stilets are then removed and the lumen of the needles filled with novocain This can readily be done by using the 2 cc syringe to which a hypodermic needle has been attached The needles are then slowly advanced and as the epidural space is entered the droplets of novocain will be seen to disappear into the needle As soon as this occurs the needle will enter the subarachnoid space 2 or 3 mm , depending on the thickness of the extradural fat Injury to the individual roots of the cauda equina will always be avoided by this method

The first 10 cc of spinal fluid is removed and kept separate for chemical examination, care being taken that the novocain which might still be in the needle has been flushed out by the spinal fluid, since 1 or 2 drops of 1 per cent novocain in 10 cc of spinal fluid will increase the total protein by several milli grams The first 10 cc is kept for analysis so that the normal total protein in the region can be determined If in one case the lumbar fluid is taken and in another, a mixture of ventricular, cisternal and upper spinal fluid, or perhaps all of the fluid that has been removed, is taken confusion as to the normal value for protein may arise As the cerebrospinal fluid escapes from the lower needle it is replaced by oxygen through the upper needle This part of the technic may have to be changed if air is introduced by the spinal route for localization

needles were introduced, the sensory stimulus would cause squirming and movement of the spine, and at times the patient would become unmanageable for the rest of the procedure unless the anesthesia was supplemented by a volatile anesthetic agent. Fortunately, in 1936, pentothal made its appearance and through the kindness of the Abbott Laboratories we were able to use this drug some time before it was employed generally. We have found it satisfactory in more than 200 cases
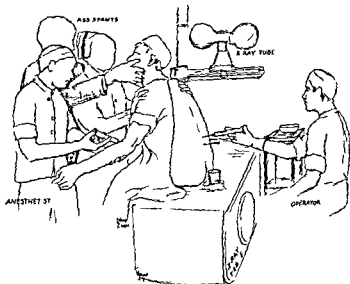
Fig. 250.—Schematic drawing to illustrate position of patient and operating team during encephalography

in which encephalography was done. Since the relaxation of the patient is complete with intravenous pentothal anesthesia it is necessary to keep the air passages free at all times and for that reason a skilled anesthetist should take charge and have facilities at hand for maintaining proper airway.

Encephalography at present is carried out with the patient sitting on one end of the x ray table with his legs hanging over the edge (Fig 250). This allows an assistant to support the patient and manipulate the head when the patient is asleep

for diagnostic purposes If it is done for both therapeutic and
diagnostic purposes, especially in cases of posttraumatic epil
epsy or headache in which faulty cerebrospinal fluid circulation
is suspected, air is used   If a tumor is found in a case in
which air has been introduced, and operation is not carried out
the same day, the patient is placed in a tent with 100 per cent
oxygen and the air disappears in a relatively short time

The technic as described above is of value since it does
away with the transportation of the patient from operating
room to the radiology department, and also allows the use of
an anesthetic agent which should not be employed for prolonged
procedures Pentothal has been satisfactory since no sign of
vasomotor collapse during its use has been noted   It is neces
sary, however, that a capable anesthetist give the anesthetic
since it is not without danger and must be handled cautiously
It should never be used unless oxygen is available   In two
cases marked respiratory depression with temporary cyanosis
was noted, but this was immediately relieved by the introduc
tion of oxygen

of a brain tumor Since we never intentionally inject air by the spinal route for the localization of brain tumors, it is not possible to say whether or not the rate with which the fluid is removed makes any particular difference as far as the resulting intracranial changes are concerned

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gentle oscillating motions and alternately flexed and extended until no more fluid will escape from the needles The amount of fluid that escapes is replaced by a similar amount of air Care must be taken that the adapter on the syringe fits snugly in the needles In two cases in our series, even though 120 cc of spinal fluid had escaped and a similar amount was supposedly injected, upon reading the roentgenograms only a small amount of air could be seen in the cisterns at the base of the brain and most of the air which was thought to be injected had actually escaped at the site of the adapter As soon as the fluid has stopped flowing the needles are withdrawn and the patient is allowed to remain in the sitting position for a few moments, the head is gently oscillated from side to side during this time The oxygen which is in the spinal canal replaces any fluid that may slowly gravitate to the spinal canal The patient is then placed on his back and anterior posterior roentgenograms are taken The films usually six in number (anterior posterior, posterior anterior, and right and left stereos), are taken rapidly while the patient is still asleep The effects of pentothal wear off in a short time and, of course, as little of the anesthetic as necessary is used The films are then developed and studied while still wet If they are satisfactory, the patient is taken back to his bed We have found that if the ventricles do not fill and there is excellent filling of the subarachnoid space no filling of the ventricles occurred even though the needles were reintroduced and fluid which had

previously carried out

Oxygen is used only when encephalography is carried out

TECHNIC OF LOBECTOMY FOR BRONCHIECTASIS

Herbert D. Adams

LOBECTOMY is one of the best standardized and most common of the thoracic operations. It is indicated principally in cases of nontuberculous destructive pulmonary sepsis confined to one or more lobes, its greatest use being in bronchiectasis multiple abscesses and, occasionally, in well localized tumors. Of these, bronchiectasis is by far the most common indication for lobectomy. Bronchiectasis is frequently improved by other methods of treatment, but it can be cured only by lobectomy. The technic of lobectomy, therefore, is concerned primarily with the management and surgical treatment of bronchiectasis.

Briefly, the preliminary management of these cases is of greatest importance. The patients should be carefully studied from a general standpoint and then from a thoracic standpoint, and a complete study of the entire respiratory tract must be made. The upper respiratory tract, particularly the sinuses, should be examined routinely by roentgen rays since we are more and more impressed with the rôle of this condition as an etiologic factor in chronic pulmonary infection.

Having determined the status of the upper respiratory tract, the next point of importance is complete visualization of the entire lung fields bilaterally after lipiodol injection. This is best accomplished by bronchoscopy to visualize directly the condition of the bronchial tree to determine the main source of the bronchial discharge and to obtain cultures and promote better drainage. At the close of bronchoscopy a catheter is left in the right or left bronchus and a roentgenogram is taken after lipiodol has been injected. By proper technic an excellent visualization of the entire bronchial tree of one lung is obtained. A few days later a catheter is introduced into the opposite bronchus and the bronchial tree of the opposite lung is sim-

The operation is carried out with little variation in the major details In preparation, a constant intravenous drip of physiologic saline solution is started in the ankle vein and several donors are available so that blood may be drawn by an assistant at any time and introduced readily into the intravenous apparatus A slow drip of blood should be started at the first drop in blood pressure or when early signs of shock appear, since the complete avoidance of any degree of shock in these patients is reflected in their smoother convalescence and avoidance of complications

Intratracheal anesthesia is important to control intrapulmonary pressure and depth of anesthesia and also to provide a method for aspiration of excessive secretions which may accumulate in large quantities unless adequately removed through out the operation In cases with marked secretions it is advisable to perform preliminary bronchoscopy and careful aspiration before inducing anesthesia

The patient is placed on the operating table on his side in the semiprone position, a pillow, bar, or inflatable pillow being placed beneath the lower ribs and flank to flex the trunk and spread the exposed ribs After wide preparation of the skin and sterile draping, an incision is made parallel to the seventh or eighth rib from the spine to the anterior axillary line Since bronchiectasis is primarily a disease of the lower lobes, an incision is made through the muscles and parietal pleura in the seventh interspace and the ribs above and below are cut just back of their angles All bleeding in the wound is very carefully controlled, the wound edges carefully protected with skin towels and gauze pads, and a spreader type of retractor is inserted (Fig 252)

Adequate exposure is essential, and if it is not obtained by this incision, a long piece of the seventh or eighth rib may be resected and several ribs cut above or below behind the angles to allow adequate spreading of the wound

If there has been a pleural reaction and adhesions have formed, as in the majority of cases, a one stage lobectomy can usually be carried out with safety

If the pleura is entirely normal, it may be best to divide the inferior pulmonary ligament, wipe the visceral pleura covering the upper lobe with dry gauze, again expand the lung and close

larly visualized   It is only by this method that an accurate
estimate of the extent of the disease can be made (Fig 251)

This is absolutely essential for the proper operative ap-
proach and particularly important to obtain good end results
Too many patients are subjected to lobectomy after only par
tial study   Serious complications result and symptoms are not
relieved because of widespread disease which was not appreci
ated because of inadequate study

Foci of infection in the upper respiratory tract, particularly
sinusitis, must be definitely eliminated and the patient placed

Fig 251 —a Bronchiectasis lipiodol injection b Six months after lobectomy
The patient is entirely free of symptoms

on an excellent general hygienic regimen plus postural drain
age for a period of months   During this period such patients
are kept under close observation and, when the maximal ben
efit is obtained, bronchoscopy is again carried out and lipiodol
is injected in the same manner for complete visualization of
both lung fields   On the basis of this examination the extent
of the disease requiring surgical eradication is determined, as
well as the number of lobes and stages necessary in each case
to eradicate the disease   The patient is then sent home on
the same hygienic regimen with postural drainage for a period
of three to four weeks, when he finally returns for lobectomy

of the pericardium from the left upper lobe, is as dependent as the lower lobe and equally prone to bronchiectatic infection it therefore should be removed routinely in left lower lobectomy The inferior pulmonary ligament is divided and the interlobar septum followed until the lobe is entirely freed down to the hilar structures (Fig 253) A heavy braided silk

Fig 253—Dissection of interlobar fissure isolating root of lower lobe *a* Application of heavy ligatures to root and lobe removed *b* Structures in root secured with mattress sutures and pleural edges closed over stump

ligature is applied with a snare type of instrument around the root of the lobe and a second one is applied just distal to the first The root of the lobe is divided between these ligatures The stump of the bronchus is cauterized with carbolic acid and alcohol and the bronchus and the obvious larger vessels are secured with chromic catgut mattress sutures The stump is

the chest This produces a protective pleural reaction in the upper part of the thorax and allows total collapse of the affected lobe, permitting, because of rest of the lobe, at least partial control of the infection within this lobe Actual lobectomy is carried out at the second stage, several weeks or many months later, depending on the progress of the patient The

Fig 252—Exposure obtained in lower part of thorax with division of inferior pulmonary ligament as far as inferior pulmonary vein in lung root

technic of the second stage lobectomy is very similar to that of the one stage procedure

If lobectomy is decided upon, the lobe or lobes to be removed are freed up that is the lower and middle lobes on the right and the lower lobe and the lingula of the upper lobe on the left This latter tongue of tissue, extending down in front

of the pericardium from the left upper lobe, is as dependent as the lower lobe and equally prone to bronchiectatic infection, it therefore should be removed routinely in left lower lobectomy. The inferior pulmonary ligament is divided and the interlobar septum followed until the lobe is entirely freed down to the hilar structures (Fig 253). A heavy braided silk

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a Application of heavy ligatures to root and lobe removed *b* Structures in root secured with mattress sutures and pleural edges closed over stump

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held with a Kocher forceps, the mass silk ligature is loosened and any further bleeding is carefully controlled by ligatures Finally, the cut pleural edges are closed over the stump with a continuous catgut suture   The right middle lobe is removed in a similar manner

On the left, the lingula is simply cut across, the vessels and bronchus secured with ligatures, and the cut pleural edges are fully approximated with continuous catgut suture

Having thus carefully covered all raw lung surfaces with pleura, the pleural cavity is carefully flushed out with saline solution and a catheter (No 24) is introduced through a stab wound in the ninth or tenth interspace in the posterior axillary line, the catheter extending in the chest to a point near the stump of the amputated lobe   The wound is carefully closed in layers and as closure is accomplished, the intra tracheal pressure is increased expanding the remaining lobe and the catheter is clamped off   The bronchial tree is carefully aspirated and the intratracheal tube removed   The patient is immediately returned to bed, the foot of the bed being elevated to promote drainage and the operated side being kept down   At the same time the patient is put into an oxygen tent and gentle suction (2 to 3 inches of water pressure) is applied to the drainage tube in the chest   Fluids are administered intravenously at a slow drip through the cannula in the ankle vein

It is not intended in this article to discuss the extremely important details of the postoperative treatment   This consists chiefly in preventive measures and in the prompt and effective management of the many complications which may arise very suddenly in these seriously ill patients

Lobectomy is then the treatment of choice in cases of advanced bronchiectasis   A cure may be obtained with comparative safety provided proper care and judgment are exercised in each individual case   The technical aspects of the operation have become well standardized and the operation is safe

THE MANAGEMENT OF EMPYEMA

Herbert D. Adams

In the management of patients with empyema the actual technic of drainage is comparatively simple. The principles of drainage involved however are of the greatest importance if serious complications and prolonged illness are to be avoided. Empyema which is improperly managed occurs much too commonly and the subsequent treatment and course in these cases are difficult and hazardous. Patients in whom drainage is inadequate soon show the effects of extensive chronic infection and often reach extreme degrees of cachexia and anemia making them serious risks when more radical treatment becomes necessary. These stages of the disease with their attendant fatal complications such as amyloid disease and metastatic infection and particularly brain abscess can be prevented by the early and adequate treatment of the primary empyema.

The principles involved in such treatment require first early recognition of the disease. The history is usually characteristic and empyema should at once be considered if convalescence is delayed if health is not regained promptly or if there is further debility and persistence of fever following any form of respiratory infection whether an upper respiratory infection or frank pneumonia. Any patient who falls in this category should have painstaking and frequent examinations of the chest including roentgenograms. If there is clinical and roentgenologic evidence of fluid in the pleural cavity careful thoracentesis should be done removing a small amount of fluid for examination and culture. If frank thick pus is obtained drainage should be instituted at once preferably by rib resection and open thoracotomy. However if thin watery fluid is obtained a careful culture is made and if organisms are reported closed drainage should be instigated as soon as possible

by trocar thoracotomy   If a large amount of thin purulent
material is present, particularly in children it is best to de
compress the thoracic cavity, slowly removing 3 or 4 ounces
every half hour until the fluid is completely removed   Then
either gentle suction is applied to the tube (2 inch water pres
sure) or continuous but closed drainage is maintained by plac
ing the end of a long connecting tube beneath the surface of
water in a large bottle on the floor at the side of the bed

Of equal importance is the simultaneous consideration of
the principles of dependent and adequate drainage (Fig 254)
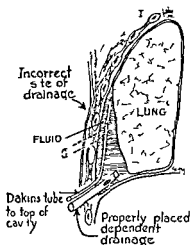
Fig 254 —Drawing illustrating proper site of drainage

Whether, owing to the character of the pus rib resection or
trocar thoracotomy is indicated it is essential to determine
the most dependent limits of the cavity and to introduce drain
age at this point Using a series of sterile aspirating needles
successively lower interspaces are tapped in the vertical line

e
t
ed by
ect to
adult

patient a No 24 catheter is best, in a child a No 14 16 or 18 should be used If open drainage by rib resection is instituted the actual size of the cavity should be calibrated by aspirating the fluid with suction until the cavity is dry and by introducing a measured amount of physiologic saline solution until the cavity is full In very large cavities, several large caliber tubes should be introduced into the dependent limits of the cavity and one or more Dakin s tubes should be placed to extend to the upper limits of the cavity so that complete and efficient irrigation of the cavity may be carried out later on during convalescence

Fig 255—a Extensive recurrent empyema This patient was seriously ill the organism Streptococcus haemolyticus b Adequate dependent drainage is shown Previous drainage site can be seen improperly placed two ribs above

When adequate drainage has been established it then becomes essential to maintain this drainage and to irrigate the cavity until it is completely healed This requires constant and personal supervision of the patient frequent calibration of the size of the cavity changing and shortening the tube as the cavity fills in During the period of hospitalization the cavity is irrigated three times a day with physiologic saline solution or better some nonirritating antiseptic solution such as soluchloramine

Upon leaving the hospital these patients make the best progress by having a district nurse visit them for a daily irrigation and dressing An office visit should be made once

a week for management and adjustments of the tube Later,
as the cavity becomes smaller, these visits may be at two week
intervals It is also important that these patients be kept on the
best possible general hygienic regimen and that they be
encouraged to breathe deeply or use blow bottles to help oblit
erate the empyema cavity (Fig 255)

This treatment is necessarily protracted and runs into many
months before cure is accomplished These principles cannot
be overlooked, however, since if the tube is removed before
the cavity has completely filled in recurrence of the process is
certain to follow

Chronic, inadequately drained empyema recurrent empy
ema and tuberculous empyema become special problems They
result in a rigid walled cavity with persistent chronic infection
and the extensive thoracoplasty and plastic procedures which
then become necessary are serious in the case of debilitated
patients and in the presence of infection These complicated
stages of the disease must be avoided and this can be done
only by careful observance of these important principles

The principles of treatment therefore embody early recog
nition of the process adequate and dependent drainage, pro
longed under detailed management until the cavity has com
pletely healed

TECHNIC OF RADICAL MASTECTOMY FOR CARCINOMA OF THE BREAST

Samuel F. Marshall

THE successful treatment of carcinoma of the breast depends upon a great number of factors not the least important of which is a thorough radical mastectomy. Despite the occasional article in the literature advocating simple mastectomy without dissection of the axillary contents it is agreed by most surgeons experienced in this problem that radical mastectomy should in the majority of cases be the basis of treatment of this disease. It is conceded that satisfactory results depend to a large measure upon early recognition of the disease yet it also must be admitted that the best results are obtained by early and thorough removal of the axillary contents as well as amputation of the breast itself.

Failure to remove the axillary lymph nodes as a routine procedure results in failure to control the disease in a large number of individuals as is evident from a study of any group of cases. In a follow up study of 196 patients who were operated on for carcinoma of the breast at the Lahey Clinic (reported by Marshall and Higginbotham) involvement of the lymph nodes was noted in 50 per cent of the patients who survived five years and in 42 9 per cent of those who survived seven years. It is therefore obvious that if radical mastectomy had not been performed this group of patients would have been denied the opportunity of a possible cure.

There are however certain definite indications for simple mastectomy and we not infrequently use this method in elderly individuals or as a palliative measure in cases of advanced carcinoma of the breast such as for removal of foul ulcerating lesions. It may be necessary to employ this operation also in the presence of a severe cardiac disorder or chronic debilitating disease such as tuberculosis.

In general, radical mastectomy is advised and carried out as the method of choice at the Lahey Clinic for the large majority of carcinomas of the breast   This applies also to patients with palpable axillary nodes, unless the involved nodes are large and fixed to the surrounding structures   The operation is contraindicated in the presence of signs indicating advanced disease, such as edema of the arm or metastasis in the supraclavicular lymph nodes lungs pelvis or bony skeleton

In addition to a thorough physical examination all patients with carcinoma of the breast are very carefully examined for evidence of metastasis   This search for the spread of carcinoma beyond the breast should include, especially, examination of both axillae and supraclavicular regions the opposite breast and the pelvis   Routine examination of the chest by roentgen rays is carried out before operation, but roentgenograms of the spine pelvis and long bones are obtained only when attention is directed to the bony skeleton by a history of pain or arthritic involvement in these regions

It is the practice in the clinic to advise removal of all tumors of the breast and to submit these tumors to immediate microscopic examination   Immediate radical removal of the breast is then performed if the tumor proves to be malignant With those tumors that are frankly malignant on clinical examination radical mastectomy is performed without first resorting to local excision and microscopic examination

The technic of radical mastectomy has been fairly well standardized since the adoption and description of the procedure earlier by Halsted[3] Meyer and others[6]   The technic employed by various authors may differ in certain details but, in general the operation consists of amputation of the involved breast together with removal of the pectoralis muscles and a clean dissection of the axillary contents

We wish to present in this paper the technic of radical mastectomy as employed in the Lahey Clinic at the present time

After induction of general anesthesia the operative field is painted with half strength tincture of iodine (3 5 per cent) and the arm wrapped in sterile drapes is placed upon an arm board at right angles to the body   Several types of incision may be used with equally good results and in our experience

the type of incision adopted depends upon the location of the tumor We generally use an incision encircling the breast and extending above and below the breast as a simple vertical incision (Fig 256) The incision above the breast extends within 2 to 3 cm of the midpart of the clavicle, and below the breast beyond the border of the pectoralis major muscle If desirable for better exposure of the axilla, the incision above the breast can be extended onto the arm, but this is usually undesirable and results in cicatricial tissue in the anterior fold
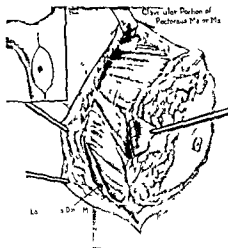
Fig 256—Encircling incision about the breast extended above and below by a vertical incision The skin flaps are developed by sharp dissection laterally to the latissimus dorsi muscle and medially to slightly past the midline of the thorax The interval between the clavicular and costal portion of the pectoralis major muscle is easily seen upon dissection

of the axilla which may limit abduction and free movements of the arm This has been emphasized in later reports by Halsted [2] The transverse incision, as advocated by Stewart, and the incision described by Greenough, can be employed to advantage in some cases and with satisfactory results The vertical incision is quite satisfactory, however, does not limit axillary exposure, and provides a good skin flap to cover the axilla at the completion of the operation without placing a scar in the axillary area A wide margin of skin, at least 5 cm

from the border of the tumor on either side should be removed along with the breast

The skin incision to be employed is outlined and carried through the skin to the subcutaneous tissue The dissection is then carried laterally until the insertion of the pectoralis major muscle into the humerus and the latissimus dorsi muscles are cleanly exposed The subcutaneous tissue is removed close to
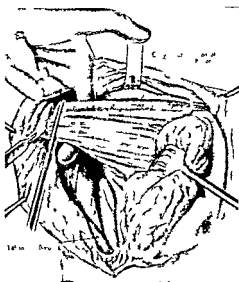
Fig 257—Clavicular and costal parts of pectoralis major muscle are readily divided the clavicular portion being retracted upward The left index finger is passed back of the exposed tendon of the costal portion of the pec toralis major muscle The tendon is then gra ped by an Ochsner forceps and severed near its insertion into the humerus

the skin All bleeding vessels are ligated with fine black silk silk is used throughout the operation The medial skin flap is then dissected to the midline of the chest over the sternum and carried to the thoracic wall beyond the origin of the pectoralis major muscle The fascia of the pectoralis major muscle is exposed just below the clavicle and the interval between the costal and clavicular portions of the muscle is readily seen (Fig 256) The division of these two portions of muscle can

be easily made by sharp dissection to their insertion on the humerus without bleeding, as they are united by a thin avascular fascial tissue

We do not ordinarily remove the clavicular portion of the pectoralis major muscle unless the growth is large or involves the upper half of the breast It does not interfere with exposure of the anterior portion of the axilla The index finger of the left hand is now easily placed beneath the tendon of the
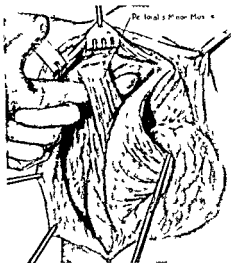
Fig 258—Pectoralis major muscle retracted medially and downward The coracoclavicular fascia has been incised and the pectoralis minor muscle exposed The index finger is passed beneath the tendon of the pectoralis minor muscle and the tendon is divided close to its insertion into the coracoid process of the scapula thus completely exposing the axilla for dissection

pectoralis major muscle near its insertion and the tendon is severed close to the humerus after it is grasped by an Ochsner forceps, which acts as a retractor on the muscle and assists in elevating the muscle medially (Fig 257) This muscle is then retracted medially and downward, which exposes the coracoclavicular fascia covering the pectoralis minor muscle and the axillary vessels This fascia fuses with the sheath of the axillary vessels, blends medially with fascia covering the first and

second intercostal space, invests the pectoralis minor muscle, and continues laterally to join the axillary fascia The coraco clavicular fascia is then incised and the pectoralis minor muscle exposed (Fig 258) This muscle is cleanly dissected up to its insertion in the coracoid process

It must be remembered that the acromiothoracic vessel are parallel and medial to the muscle border, whereas the long thoracic artery is parallel and lateral to the pectoralis minor muscle These vessels can be readily seen and avoided injury to them would interfere with a clean dissection of the axilla

The index finger is now passed beneath the tendon of the pectoralis minor muscle and the muscle is divided at its in er tion into the coracoid process This muscle is then retracted downward and this immediately exposes the axilla and permits ready dissection of the region The subclavian vein is exposed at its highest point and the dissection of the axilla is begun at its apex, progressing cleanly from above downward along the axillary vein The loose connective tissue, fat and lymph nodes are stripped cleanly from the vein, exposing, dividing and ligating the acromiothoracic, long thoracic, alar thoracic and the subscapular arteries, from within outward along the axillary vein All vessels are divided and ligated close to the axillary vein as soon as they are isolated All loose tissue above the vessels and brachial plexus is also removed cleanly

The costal insertions of the pectoralis major and minor muscles are then divided beginning at the clavicle and pro ceeding downward toward the rectus sheath (Fig 259) A considerable portion of rectus sheath is removed, exposing the fibers of the rectus muscle All vessels issuing between the ribs are clamped divided and ligated as the dissection pro gresses Very little bleeding occurs if the vessels are care fully exposed and clamped before they are torn or cut The mass consisting of the breast and pectoral muscles is retracted outward and the muscle and fascia are divided close to the ribs and serratus magnus muscle Traction is continued and the dissection is carried to the junction of the posterior and lateral walls of the axilla, removing all loose tissue and lymph nodes from the latissimus dorsi teres major and subscapularis muscles posteriorly and the lateral wall of the chest which is covered by the serratus magnus muscle The dissection is

continued outward until the subscapular vessels are exposed, these vessels are divided and ligated   The long subscapular nerve on the posterior border of the axilla is usually preserved, but it is removed if enlarged lymph nodes are found along the subscapular vessels.   The long thoracic nerve supplying the serratus magnus muscle is preserved along the inner part of the axilla
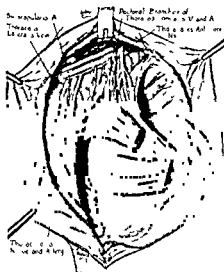
Fig 259—Coracoclavicular fascia incised and stripped from the axillary vessels   The various vessels are clamped and divided close to the subclavian and axillary veins   The veins are stripped cleanly   All loose tissue and lymph nodes above the vessels and about the axillary plexus of nerves are removed cleanly   The breast and muscles are not removed from the chest wall until this dissection is complete   The point of division of the costal insertion of the pectoralis major muscle is shown by the dotted line

The mass of tissue is then turned back on the chest wall and divided along the previously exposed edge of the latissimus dorsi muscle   All lymph nodes and loose connective tissue

breast, muscles, lymph nodes and connective tissue are removed in a single mass which minimizes the liberation of cancer cells in the wound by cutting through diseased tissues (Fig 260)

The removal of the muscles from the chest wall is delayed until the axillary contents along the subclavian and brachial veins are cleanly dissected beyond the subscapular vessels
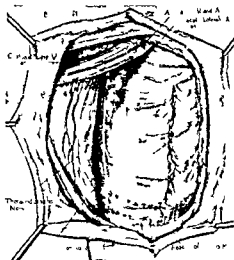
Fig 260—The breast pectoral muscles lymph nodes and loose connective tissue have been removed in one piece The axillary vessels are stripped cleanly All loose tissue and lymph nodes have been removed from the posterior border of the axilla over the latissimus dorsi teres major and subscapularis muscles The thoracodorsalis (long subscapular) and the thoracalis longus (long thoracic) nerves have been preserved The fascia of the rectus muscle is also removed over a considerable area (more than is shown in the figure)

This permits the breast and muscles to be left as a protective covering of the chest wall until operation is almost complete Furthermore as dissection progresses all exposed tissues are covered with warm moist towels this greatly assists in preventing shock When vessels are clamped before dividing the blood loss is small and when attention is directed to unnecessary exposure of dissected tissue shock is not a common accompaniment of such an extensive dissection

We routinely give to these patients preop
cutaneous injection into the thigh of 5 per ce
saline solution (1000 c c), which acts as a rese
placement of fluid during the operation and aids m
preventing shock

The wound is then inspected for bleeding point
closure and is in most instances remarkably dry The
edges are approximated with interrupted sutures of fine black
silk No subcutaneous sutures are employed and no sutures
are used to tuck the skin flap high into the axilla The skin
flap is allowed to fall naturally in place in the axillary descent
and is held in place by slight pressure from the dressing pads
and bandages to obliterate any dead space The arm is
bandaged to the side of the chest and the forearm placed across
the body in a sling The axilla is not drained In most in
stances healing takes place primarily and without the accumu
lation of fluid If fluid does appear it can be readily aspirated
with a sterile needle This method is more satisfactory than a
drain which may not be present in the region where the fluid
may gather

If we are unable to approximate the skin edges without
great tension we prefer to close the defect as much as possible
with the available skin flap and proceed with a Thiersch graft
either immediately or within a few days

The arm is released twenty four hours after operation
and gently abducted and fully extended This can be accom
plished without distress to the patient and the range and free
dom of arm motion is more easily restored by early motion than
by delaying over a number of days We have seen less dis
ability by initiating motion early No ill effects upon wound
healing have occurred If convalescence is uncomplicated the
patient is encouraged to be out of bed by the fourth or fifth
day and usually may be discharged from the hospital on the
tenth day after operation

We have not employed preoperative roentgen therapy in
the clinic and consequently have had no experience with it

Roentgen therapy is instituted usually ten days or two weeks

after operation It has not delayed convalescence or interfered materially with wound healing The treatment as planned and carried out by Dr Hare consists of the administration of 2 400 roentgen units over three areas the supraclavicular, axilla and breast Daily small doses are given usually not more than 300 roentgens being given on any one day No serious difficulty has arisen from roentgen therapy

Following operation and roentgen therapy all patients are examined regularly at intervals of three months for a period of two years Fluoroscopy of the chest constitutes part of the examination After two years the patients are examined at six month intervals

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3 Halsted W S The results of operations for the cure of cancer of the breast performed at the Johns Hopkins Hospital from June 1889 to January 1894 Johns Hopkins Hosp Rep 4 297 350 1894

4 Marshall S F and Higginbotham J Carcinoma of the breast Analysis of 196 cases Surg Clin N Amer 18 615–624 (June) 1938

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THE TECHNIC OF TRANSURETHRAL PROSTATECTOMY

Earl E. Ewert

Transurethral resection for obstructing lesions of the bladder and bladder neck is generally conceded by urologists to be a procedure requiring technical knowledge and skill. It has always been acknowledged that the use of the lithotrite by the inexperienced operator is hazardous and that suprapubic cystolithotomy is the safer procedure. It is equally true that open operation is safer than the occasional transurethral resection for relief of prostatic obstruction.

The controversy over transurethral removal of prostatic obstruction as against open surgical operation will subside in a large measure when urologic surgeons have acquired the necessary skill in performing transurethral prostatectomy. Many surgeons will not submit to the period of study necessary to learn this most individual procedure owing to its attending higher mortality and morbidity. Acquisition of the necessary skill has meant for most surgeons harrowing experiences. The extremely low mortality and morbidity reported by urologists after such experience is acquired have not been duplicated for the most part with any other operative procedure for the relief of prostatic obstruction. As the operator becomes more skillful, prostatic enlargements which at first were reserved for open operation will be treated by transurethral resection. Very large hypertrophied glands probably will always be removed by open surgical procedures. They occur infrequently, however, since the majority of hyperplastic glands weigh between 25 and 35 gm.

In performing transurethral prostatic resection meticulous attention to details is essential. Many errors have been committed owing to an erroneous conception of bladder neck configuration. In our experience the ability to judge the size,

after operation It has not delayed convalescence or interfered materially with wound healing The treatment as planned and carried out by Dr Hare consists of the administration of 2,400 roentgen units over three areas the supraclavicular axilla and breast Daily small doses are given usually not more than 300 roentgens being given on any one day No serious difficulty has arisen from roentgen therapy

Following operation and roentgen therapy all patients are examined regularly at intervals of three months for a period of two years Fluoroscopy of the chest constitutes part of the examination After two years the patients are examined at six month intervals

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The point to be taken seriously in regard to inlying catheters and the attending morbidity with this at times unsatisfying method of bladder drainage is the consideration of a suprapubic puncture with a trocar and the insertion of a catheter through the cannula. Engel has shown that careful suprapubic puncture of the bladder in the hands of one conversant with its dangers is a most benign procedure and eliminates the factor of prolonged urethral drainage.

Determination of the extent of the prostatic hypertrophy and bladder disease and the contour of the bladder seems to us to les en the usefulness of cystograms when some of the knowledge can be gained by excretion pyelography. Excretion pyelography and cystograms obtained therefrom help in eliminating catheterizations. By means of this procedure the amount of residual urine can be estimated from a skiagram of the bladder region after the patient has voided. This has been advocated previously by others. However cystograms many times reveal diverticula, stones, tumors and ureteral regurgitation that perhaps might be missed in a poorly distended bladder.

Rectal examination intelligently made and noted preferably by means of a diagram is of course the initial step in the estimation of prostatic hypertrophy. The extent of the extravesical protrusion of the prostate and some idea of the size of the gland proper usually can be gained by the finger surprisingly well (Fig 261). The unequal protrusion of one lateral lobe over the other and the deviation of the median furrow or groove should be carefully noted and better still diagrammed so that the surgeon may always keep this in mind while operating. The use of the finger with the O Conor sheath, and determination of the thickness of the prostate and the inequality of the extent of the prostatic hypertrophy will prevent cutting into the periprostatic and perivesical spaces. We have been impressed with the incorrectness of our picture of prostatic glandular thickness when it was compared to the prostate as felt over the resectoscope and we cannot stress too forcibly this simple maneuver.

Preparation of the patient necessarily includes an estimation of his general condition. The pulmonary and cardiac status should be determined not only with regard to the pa

shape and degree of bladder neck obstruction is the secret of successful transurethral prostatic surgery This requires more consideration than simply noting the size of the gland To us it means ability to recognize the actual degree of tissue obstruction in relation to the anatomic danger points Those who become the most successful operators most quickly observe these few cardinal points

Patients are prepared for transurethral resection as care fully as if they were to be submitted to open operation The period of preparation we believe consists in part in the estimation of the type and extent of the bladder neck disease with however the avoidance of unnecessary urethral manipulation Indiscriminate cystoscopic examinations are to be condemned for, after useless manipulation the patient frequently loses enough ground so that a successful outcome is doubtful or morbidity due to infection is produced Embarrassed renal function and urinary tract infection are treated before operation by drainage if the quantity of residual urine is great and the infection produces fever but catheter drainage for moderate amounts of residual urine and small degrees of renal impairment and infection without fever makes for acute prostatitis acute cystopyelitis and septicemia Frequent determinations of the level of blood nitrogen and phenolsulphonphthalein tests are desirable and when this level reaches a point from which it cannot be improved all things considered the patient is ready for operation

Urinary tract infection and lack of good renal function may have to be treated by the use of the indwelling catheter The use of the Foley retention bag in the small catheter sizes is a distinct improvement in handling this type of patient The catheters are definitely more comfortable are so to speak self adjusting and permit free drainage of urethral secretions from the always present urethritis attendant upon an inlying catheter The sudden appearance of fever and toxicity in a patient with an indwelling catheter calls for examination of the entire urethra A severe urethritis may result from a catheter which fits too tightly especially in a debilitated individual This can of course produce peri urethral abscesses should it become neglected or it may account for the appearance of urethral strictures months after resection

large amounts of tissue will frequently enable a surgeon to resect a gland at one operation which otherwise might require multiple procedures. Patients are using operation are always made ambulant if possible in order to decrease pulmonary complications and to preserve general body vigor. It has long been recognized that confining a sufferer from prostatic hypertrophy to bed for long periods in order to prepare him for operation brings him to it a poor physical specimen.

The period of preparation for transurethral resection seems to us less than that required for patients who formerly underwent open prostatic operation.

All patients have at least a preliminary roentgenogram made of the genito-urinary system and this at times discloses sufficient evidence of disease in the upper genito-urinary tract not revealed by the usual preliminary preparation to justify further investigation. Renal calculi, ureteral calculi and metastatic bone deposits may frequently be discovered by this simple procedure. A chart of fluid intake and output is kept in order that no patient will come to operation in poor fluid balance. The use of drugs such as mandelic acid and ammonium chloride to produce acidification before operation should be watched with care so that acidosis will not result in lowered renal function. Determinations of the carbon dioxide combining power and of blood chloride values may be necessary at times both preoperatively and postoperatively in order to preserve the proper chemical balance in these necessarily unstable individuals. The offending organism in the urinary tract should be determined more often in order that sufficient medication may be applied.

It is recognized that severe Proteus infections are poorly if at all combated by the use of mandelic acid. Sulfanilamide brings this infection more quickly under control however routine administration of a drug such as sulfanilamide with the resultant secondary anemia is perhaps to be avoided. Should it be necessary to employ this drug transfusions may be required to preserve a blood picture which approaches normal. Mandelic acid also has the disadvantage of at times decreasing the already poor appetite and we feel that preliminary urinary medication must be individualized. We have found as have others that the use of salihexin intravenously

tient's fitness for operation, but as to how extensive an opera
tion is justifiable at one stage or whether or not to operate on
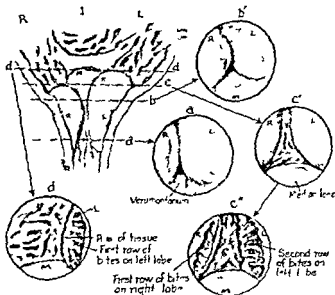
Fig 261—1 Section through the prostatic urethra and vesical neck, por
traying the inequality of the hyperplasia The amount of tissue removed will
not be the same from each lateral lobe a Fore-oblique view at the veru
montanum revealing it to be covered by the overlapping lateral lobes The
latter extend into the retromontane urethra Failure to remove this portion
of the gland will not relieve the patient b The anterior cleft is displaced
to the right at the vesical neck The left lobe is the more prominent Urethral
topography demonstrates actual amount of obstruction c The right lateral
lobe at the intravesical level d The first row of bites on the left side
The right lobe does not protrude as much hence is not in the field Note
tissue is not cut to actual bladder margin at this time c Illustrating the
fact that a second row of cuts may be made at this level as compared with
the right side For purpose of illustration the bites on right side are shown
but actually are not taken until all of either right or left lobe is removed as
the case may be

a very aged and markedly debilitated patient in two stages
It is questionable whether it is advisable to submit a patient
to more than two operations Experience and ability to remove
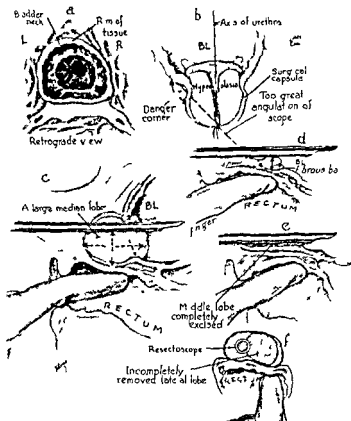
Fig 262—*a* Retrograde portrayal of complete prostatectomy except for rim of tissue left until the end of resection Note that the bladder neck remains and a funnel shaped vesical orifice is not actually obtained The surgical capsule is present in the prostatic urethra the caliber of which is larger than the bladder neck This must be so in order to perform complete prostatectomy by this method *b* The danger corner is the periprostatic or perivesical space formed by the constricting action of the vesical sphincter on the hypertrophy Ignoring this will lead to extravasation The scope will have to be angulated sharply to remove the intravesical tissue but as the neck is reached the axis of the instrument should approach that of the urethra This is extremely important *c* Estimating the thickness of the tissue between the instrument and the finger is the only reliable method to gauge the extent and amount of hyperplastic gland Ignoring this courts disaster *d* The amount of fibrous tissue in a contracture or fibrous bar is small Palpation as illustrated is most informative The excursion of the cutting loop is very limited Cutting through in this type of obstruction is easy and the depth of one loop may carry into the perivesical or subringonal tissue spaces *e* The median lobe is completely excised The finger in the rectum can assist in pushing hyperplastic tissue into the field if necessary *f*, Supposedly visual resection checked by the finger in the rectum and a spheroid of tissue still present Any hypertrophy can be detected in this manner at once Rectal palpation over the resecto cope is mandatory at the end of any resection

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once or twice daily is helpful in reducing the infection and fever This is given morning and night daily for two or three days before, and for several days after operation The blood of most patients is typed so that a donor can be summoned without delay if blood transfusion becomes necessary Blood transfusions are given at times to prepare patients whose hemoglobin reading is below 70 per cent and again on the day after operation As pointed out by Thompson and his associates the loss of blood may be surprisingly large Loss of blood can determine the outcome in the case of a bad risk patient

Spinal anesthesia is used for our patients and sufficient anesthetic is given to allow for a procedure lasting an hour Bars and very small obstructions can and have been removed many times by others with the patient anesthetized with sodium penthotal This anesthesia can be prolonged for a considerable time Rapid operators remove surprisingly large amounts of tissue during this time We feel that spinal anesthesia allows us sufficient time so that we are not consciously hurried

Many patients suffering from prostatic hypertrophy are brought to operation overmedicated We feel that this should be avoided It seems to induce mental confusion which is prolonged in the convalescence of advanced arteriosclerotic patients making their nursing care exceedingly difficult These patients have to be restrained and at times wear themselves out physically in their delirium

Patients are cleansed after being placed on the cystoscopic table in the lithotomy position and the field of operation is draped as for any open surgical procedure The O Conor sheath is found to be helpful in that the finger cot can be used many times in the course of the resection to determine the thickness of tissue and to push up tissue which cannot be readily reached without changing the technic (Fig 262) Preliminary vasectomy is usually done However in men under fifty years of age in whom contractures are frequently met with vasectomy is omitted

Cystoscopy is done with the No 24 pan endoscope liquid petrolatum and vaseline being used as lubricants We have found that the water soluble lubricants disappear in the course of the operation and that the acute urethritis sometimes occur
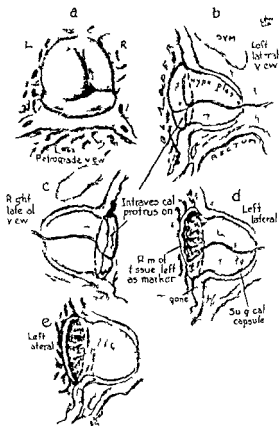
Fig 263 — a Intravesical protrusion in an actual case showing the in equality of the hypertrophy of the lateral lobes There is some degree of in equality between lateral lobes in a majority of cases of hypertrophy Th s asymmetry of the bladder neck should be carefully observed b Amount of tissue to be removed on left s de as compared with right side c d Approach to the vesical neck from the intravesical protrusion The median lobe is re sected last The median lobe almost overhangs the trigone in this case Al though accidental cutt ng of the trigone may not do any harm it indicates confusion and lack of orientat on Cutting down through this structure into the subtrigonal layers is dangerous e The incl ne to the vesical lip is now completed The revision henceforth is intra urethral The trigone in this case can never be seen from the urethra Any attempt to make it so means cutting through the prostatic capsule into the periprostatic fascial layers All of these illustrations outl ne this cardinal point

ring postoperatively is avoided to a large extent by mineral oil and vaseline The pan endoscope gives us a true picture of the vesical neck, and the lack or presence of glandular tissue in the midline particularly may be noted, intra urethral protrusion observed, and any asymmetry in the gland checked so that injudicious cutting will not be performed Following this a curved Van Buren sound, No 28 or 30 French, is passed If this is not possible preliminary meatotomy is done If the urethra is small and will not admit a No 28 instrument resection through a perineal urethrotomy incision is to be considered It should be emphasized that overstretching and tearing of the urethra will surely produce stricture Except in the case of the excision of median bars, the use of a No 24 resectoscope is not feasible With the introduction of the resectoscope the vesical neck topography is again checked with the retrograde lens (Fig 263) The location of the trigone and the ureteral orifices is carefully noted and the amount of intravesical protrusion also determined Small spheroids will occasionally be found to have herniated through the internal sphincter and their true picture will not be disclosed until the retrograde telescope is used

We are in the habit of performing litholapaxy before resection In the case of large prostate glands it can be done after the resection has been completed We believe that the crushing of stones should if possible be performed before the prostate is cut, as movement of the instrument may encourage bleeding and necessitate reintroduction of the resectoscope for demostasis

The presence of diverticula in a trabeculated bladder demands protection from overdistention during resection With the topography of the vesical neck obstruction well in mind noting the amount of intravesical and intra urethral protrusion

danger of urinary extravasation When the series of cuts is made in the intravesical portion the resectoscope is angulated across the midline in order to remove this tissue However as the resection is carried back on the lateral lobe the line of the

either side   Failure to observe this results in some of the surgical accidents encountered

No attempt is made during the resection to remove the tissue from the loop   The resection is carried out with multiple excursions of the loop to each filling of the bladder and hemostasis is effected with the coagulating current only when the vision becomes obscured

The frequent coagulation of vessels definitely affects the postoperative course, in resections in which much coagulation has been done we have been impressed with the febrile course and the long period which the urine takes to clear   Coagulation of the 'key' vessels at the clefts obviates the necessity for time consuming coagulation of small vessels   However we do not mean to imply that large arteries are neglected for we attempt at all times to keep our irrigating fluid fairly clear

The median lobe is usually cut last because we have found the projection of this median lobe to assist materially in keeping the resectoscope in the field and to allow readier access to the lateral lobe

Injudicious movement of the instrument inflicts trauma to the canal, promotes urethritis and possible stricture in the future   The beak of the resectoscope is sharp and it engages underneath the cut edge of the trigone lacerating the soft trigonal tissue layers   This accident has been caused by us in the past without cutting the structure itself   The elevation of the beak of the resectoscope toward the roof is to be continually practiced during the resection and this will prevent some of the so-called floating trigones which we believe have been caused by the beak of the instrument itself

When a region such as a median lobe is being resected and carried back into the urethra the resectoscope need not be moved from the area last cut as the bladder is evacuated   In this way reorientation is only a matter of a few seconds and a series of multiple cuts can be made without much delay The median lobe is cleansed from one lateral niche to the other and carried back into the urethra in this manner   The orderly progression of removal of the median lobe from side to side and toward the verumontanum is to be observed if an adequate amount of tissue is to be removed at one sitting   The thick

resectoscope is held more in the midline The first series of bites is carried down from the roof to the lateral clefts if present This is repeated in a methodical manner, perhaps not starting so near the midline at the roof because, at this point, the tissue is thinned out

The second group of bites down to the cleft will, as has been demonstrated by Flock's work, take care of the blood supply to the lateral lobes and most of the blood supply to the gland With these bites, which are made multiple and as fast as the lever can be actuated without distending the bladder, the resection is carried backward toward the verumontanum removing the hypertrophied tissue from the lateral wall and the midline on the roof, and leaving the hypertrophy near the floor until the lateral lobe is almost completely resected A small bit of tissue is left at the same transverse level as the verumontanum because in cutting this the bleeding from the capsular vessels will continually cloud the field

All hyperplastic tissue is excised as would be done in other forms of prostatectomy The hyperplastic tissue is removed with the loop until the peculiar striation of the so called surgical capsule which in reality is the compressed prostatic tissue appears This can be recognized from the circular arrangement of the tissue strands and can be checked repeatedly by the finger in the rectum through the O Conor sheath

If one persists in attempting to cut through this the large capsular veins and vessels will be opened and bleeding will be controlled with difficulty or not at all necessitating compression with the hemostatic bag We believe that this procedure has caused such free bleeding at the beginning of operation that it accounts for many of the incomplete and imperfect resections This is especially true of small prostate glands since most of our difficulty in the past has been in over zealous removal of tissue from small enlargements The difficulty with which this surgical capsule is cut is readily recognized with little experience and its appearance denotes complete removal of the hyperplastic tissue from this area

Following the removal of the right lateral lobe the removal of the left lateral is done in the same manner allowing for any discrepancy in the amount of hyperplastic tissue present on

will have to be carried on about either side of the verumon tanum on the lateral lobe in the retromontane urethra because of the obstructing tissue. Careful resection here denoting the character of the hypertrophy and keeping the excursion of the loop into a small area avoids cutting the external sphincter

Obstructing nodules are left in this area near the midline probably more often than in any other place and small lumps of intra urethral prostatic tissue of the lateral lobe account for much of the postoperative morbidity. This can be readily seen by reintroduction of the pan endoscope which allows the tissue to collapse more readily than does the resectoscope. Also it will be noted that as the resection proceeds in either lateral lobe, hyperplastic tissue is released and the resection which at the time was thought to be adequate will have to be repeated in these areas. However, aimless cutting of hyper plast c areas here and there makes for loss of time and pro longs the operation unduly

Orderly cutting from the roof to the border of the median lobe at the lateral niche and then back into the urethra in a series of regular mathematical roads should at all times be a med for. Multiple cuts made with one filling of the bladder w thout moving the resectoscope should be kept in mind in order that a transurethral prostatectomy can be performed in one stage if possible. This we believe has been our fault as with others and the frequent unbreaching of the instrument is time-consuming. After adequate hemostasis has been ef fected the small rim of intravesical tissue which was pre viously left as an intravesical landmark can now be removed. The Ellick evacuator can be applied several times in the course of a resection. Discrepancies in thickness of tissue can be detected by the finger and this can be checked with the resectoscope. Aimless cutting allows the thin film of coagu lated blood to form over the exposed surface and prevent good vision and recognition of tissue composition necessary for adequate transurethral resection

We believe that if resection is to be adequate complete transurethral prostatectomy must be done. Rapid cutting with each filling of the bladder avoids much bleeding. The opera tion should not last for more than one hour because a long operation has a definite tendency to increase the loss of blood,

ness of the median lobe and its location should be most accu
rately outlined from rectal palpation

The loop may cut into and through the true surgical cap
sule before the operator is aware of it The accurate deter
mination of the extent of the projection into the bladder and
the size of the median lobe is extremely important It can and
should be checked repeatedly by rectal examination and
observance of the appearance of the true surgical capsule as the
hyperplastic tissue is cleansed from the floor of the urethra
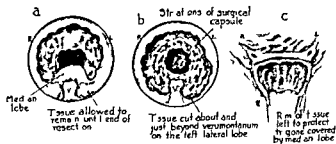
Fig 264—a The dotted lines illustrate the tissue at the apex which is
allowed to remain until the end of the resection The capsular vessels enter
here and cutting them at the beginning causes the blood to be irrigated into
the field of vision Median lobe untouched b Note that the caliber of the
prostatic urethra is greater than that of the vesical orifice in most instances
To achieve this prostatectomy is performed transurethrally c The trigone is
protected by the rim of tissue No attempt is made to remove this protective
barrier until the end of resection

As the verumontanum is approached the small amount of
tissue about it can be excised so that as the resectoscope is
drawn into the posterior urethra the yellowish color of the
hyperplastic tissue is distinguished with little difficulty from
the pale or dead white color of the true prostatic tissue or
surgical capsule Carcinomatous nodules can be recognized
in unsuspected cases by the tendency of the tissue to fray, the
apparent friability, and the dead white appearance, with seem
ing lack of vascularity (Fig 264) Following removal of the
tissue about the veru
of the capsular vessels
ently, excision of tissue

yond the field and limits of the completely distended bag
This calls for surgical drainage of the prevesical space supra
pubic drainage of the bladder with a large catheter opening
of the peritoneum to detect or to drain off the irrigating fluid
and the use of drains in the pouch of Douglas Recognition
that extravasation has occurred will eliminate much post
operative sepsis and shock and prevent mortality

After the completion of the resection and the establishment
of hemostasis disregarding the general oozing which might
occur the bladder is observed with the pan endoscope and any
remaining tissue is evacuated with the Ellick evacuator to
prevent clogging of the hemostatic bag

Hemostatic bags with a capacity of 100 c c or more are
used (sizes 20 to 22)   These large bags are necessary in
order that partial distention can be effected with 10 to 20 c c
of water and it then be pulled in the urethra   This takes care
of much of the intra urethral bleeding   Further distention of
the bag is then instituted as may be necessary to obstruct the
bleeding vessels at the intravesical margin   Often when ir
rigating the bladder at the time the patient is on the cystoscopic
table more fluid will have to be used to distend the bag to
obtain perfect hemostasis   Frequent irrigations are used at
intervals to test the efficacy of the distention   The bag may
have to be deflated and distended depending on the size of
the prostatic urethra, the amount of tissue and the amount of
intravesical removal of the prostate   Usually the bag remains
in place without tension especially when it is drawn into the
urethra with 10 to 20 c c of fluid in it   It can be completely
distended up to 100 c c   Should this not be successful after
several reapplications of the bag tension may be applied by
strapping the catheter to the leg or to a wire tripod   After
irrigation is carried out, bleeding will gradually diminish with
successful [ ] [ ] [ ] [ ] [ ] [ ] hemostasis has

be reintroduced and the offending vessel coagulated

Fluid is then injected into the catheter the catheter tied
and the patient returned to bed   We believe that the first two
hours of irrigation are most important during convalescence

The closed drainage system, which has been illustrated

the amount of shock, and the amount of fever and definitely prolongs convalescence The more rapid the urethral resection can be effected, the smoother the convalescence

Fibrous bars and small median prostatic obstructions may be resected very rapidly with little or no bleeding However definite localization of the tissue should be carefully checked by the finger over the hard instrument and with the retrograde lens so that uninvolved structures will not be cut into by the over zealous desire to remove all of the obstructing tissue Cutting into the posterior wall of the bladder can be avoided by having a free flow of water at all times

The complete evacuation of all water and gases formed should be performed often during the procedure by suprapubic compression The absence of free return of fluid demands the instant stopping of the resection until the cause is ascertained If plugging of the instrument by tissue and lack of water supply can be eliminated as the cause, then perivesical extension of the irrigating fluid and resulting loss of bladder tone more often than not have occurred Water is run into the bladder in amounts sufficient to distend it and then this is carefully checked Any little disparity is good evidence of extravesical extension The patient who previously has been lying quietly then becomes restless and begins to complain of suprapubic pain and backache In a short time becomes generalized Abdominal pain and rigidity may not appear until the spinal anesthesia begins to wear off and the patient is back in bed This pain is controlled poorly with narcotics Signs of shock such as coldness of the extremities extreme restlessness and falling blood pressure, develop as the anesthesia disappears

Early recognition that extravasation has occurred when a previously tractable patient suddenly becomes restless and complains of suprapubic pain and backache, may be life saving The field should be minutely surveyed The intravesical mucosa at the cut prostatic margin may be elevated and edematous The edema may involve the lateral walls and bulge into the bladder Gross lacerations may not be

yond the field and limits of the completely distended bag This calls for surgical drainage of the prevesical space supra pubic drainage of the bladder with a large catheter opening of the peritoneum to detect or to drain off the irrigating fluid and the use of drains in the pouch of Douglas Recognition that extravasation has occurred will eliminate much post operative sepsis and shock and prevent mortality

After the completion of the resection and the establishment of hemostasis, disregarding the general oozing which might occur, the bladder is observed with the pan endoscope and any remaining tissue is evacuated with the Ellick evacuator to prevent clogging of the hemostatic bag

Hemostatic bags with a capacity of 100 c c or more are used (sizes 20 to 22)   These large bags are necessary in order that partial distention can be effected with 10 to 20 c c of water and it then be pulled in the urethra This takes care of much of the intra urethral bleeding Further distention of the bag is then instituted as may be necessary to obstruct the bleeding vessels at the intravesical margin Often when ir rigating the bladder at the time the patient is on the cystoscopic table more fluid will have to be used to distend the bag to obtain perfect hemostasis Frequent irrigations are used at intervals to test the efficacy of the distention The bag may be deflated and distended depending on the size of the prostatic urethra the amount of tissue and the amount of intravesical removal of the prostate Usually the bag remains in place without tension especially when it is drawn into the urethra with 10 to 20 c c of fluid in it It can be completely distended up to 100 c c Should this not be successful after several reapplications of the bag tension may be applied by strapping the catheter to the leg or to a wire tripod After irrigation is carried out bleeding will gradually diminish with successful application Should this not occur hemostasis has not been effected and the bag should be deflated and reapplied If this does not control the bleeding the resectoscope should be reintroduced and the offending vessel coagulated

Fluid is then injected into the catheter, the catheter tied and the patient returned to bed We believe that the first two hours of irrigation are most important during convalescence

The closed drainage system, which has been illustrated

many times elsewhere, is already connected and filled with fluid so that it can immediately be put into use upon the patient's return to bed and irrigation is carried out every fifteen minutes during the first several hours and as necessary there after This will take care of most bleeding and prevent formation of clots Fluid is administered subcutaneously into the thighs while the patient is under spinal anesthesia thus *eliminating the unpleasantness of this procedure* Narcotics are given to control postoperative pain However, pain is not a dominant feature and little morphine will be necessary during the postoperative course The catheter is removed in twenty four or forty eight hours if possible, and the patient is got up at the same time

If the catheter can be removed in twenty four hours the bladder is filled before withdrawal and voiding is observed A large stream, even though the bladder is not completely emptied, indicates that a good functional result has been achieved Individual voidings are collected saved and recorded and the last three voidings are saved so that the degree of hematuria may be determined and any increase in bleeding detected If from 6 to 10 ounces are voided at a time and the bladder cannot be emptied by percussion in the evening manipulation is not carried out nor is the bladder examined for residual urine The amounts are observed the next day and compared with the fluid intake Frequently, when small amounts are voided associated with fever and distress the indwelling catheter must again be introduced This signifies in most instances that removal has been incomplete and that obstructing tissue remains The catheter is usually left in and the patient prepared for a second operation in five to seven days

Early removal of the catheter is to be striven for at all times in order that postoperative fever will be eliminated because of the urethritis and the close application of the bag in the prostatic urethra which prevents drainage of the tissue surfaces Urinary antiseptics do not seem to have much effect on the postoperative course although sulfanilamide derivatives *are* thought to have helped in a few instances Avoidance of urethral manipulation after operation is just as important as

before operation, and meddling determinations of residual urine soon after operation are to be avoided

Convalescence usually is smooth after a second resection and as a rule, the patients have not impressed us as being any worse or any better during their convalescent course than those in whom complete transurethral prostatectomy was effected at one operation We believe, however, that in cases in which more than two stages are necessary, the obstruction is too large and not suitable for perurethral surgery

The urine remains infected and contains frequent bits of tissue debris for six weeks following operation Medication by mouth affects this but little, however, it may help protect the upper genito urinary tract It is to be observed that in cases in which adequate prostatectomy has been done, the urine is cleared more readily than in those in which resection has not been adequate In those prostate glands in which much coagulation has been done calcareous deposits on devitalized tissue will result, and these infarcted portions will break off and at times produce signs which make the patient believe he is passing calculi At times these infarcted portions are large enough to cause urethral obstruction The persistence of this condition calls for cystoscopic examination and usually resection to remove this infected devitalized tissue Early recognition of this condition will help to eliminate infection of the urinary tract and shorten convalescence

If chills and fever persist months after transurethral prostatectomy has been performed, the possibility of infected hyperplastic tissue remaining should be considered It may be scarred over and be detected only by rectal examination or cystoscopy Calculation of the amount of residual urine and studies of the upper genito urinary tract are in order An attending seminal vesiculitis and prostatitis are to be considered and treated If conservative management with medication does not correct the infection of the urinary tract, a second operation may be indicated

Primary hemorrhage may occur after removal of the catheter Secondary hemorrhage may result weeks after resection but is not common Evacuation of the clots with the resectoscope or cystoscope and coagulation of the bleeding point suffice Cystotomy should rarely be done

Residual urine following transurethral resection will be found in these cases despite adequate removal because of irreversible pathologic conditions present in the bladder, as are seen with other forms of prostatic surgery The comparison of functional results should be evaluated on this basis as with other forms of prostatic surgery Patients often have as many symptoms following good surgical removal of obstructing tissue as following transurethral removal

In conclusion, very large hypertrophied glands should be removed by methods other than transurethral resection Most vesical neck obstructions, however, can be removed adequately and completely by transurethral surgical procedures

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THE RADICAL OPERATION FOR CARCINOMA OF THE PROSTATE

Wyland F. Leadbetter

Since Young's description of a radical operation for the cure of early carcinoma of the prostate in 1905 there have appeared at intervals papers which show clearly the value of such a procedure in properly selected cases

In 1936 Young published a summary of his results following fifty nine radical operations for carcinoma of the prostate gland Sixty one patients were subjected to the radical procedure, but one was found to have tuberculosis rather than carcinoma and, in another, a portion of the anterior rectal wall was resected These two cases should therefore be excluded Among the fifty nine cases, there were five deaths in the hospital a mortality of 8 per cent There were twenty six consecutive cases without a death and in the last thirty seven cases only one death occurred a mortality of 2 8 per cent Follow up results four years or more after operation were obtained in all but one of the thirty seven cases Dr Young reported 53 per cent apparently cured and felt that if the cases in which the prognosis was manifestly unfavorable (the cases in which the disease had progressed upward beyond the limits of the prostate and in some cases also below the prostate along the membranous urethra) were excluded the percentage of cures would be considerably increased, possibly to 70 per cent

In 1933 George Gilbert Smith reported forty two patients with carcinoma of the prostate seen during a period of thirteen years, all of whom were subjected to radical operation There were three operative deaths a mortality of 7 1 per cent Of the three patients who died, one was a man, eighty four years old, who died of shock the day after operation, another was an eighty year-old man who died of heart block three

weeks after operation and the third patient died four days after operation of heart failure A fourth patient died in the hospital three months after operation probably from carcinomatosis Seventeen others died of carcinoma with an average duration of life after operation of twenty seven months In only one of these cases did urinary obstruction develop before death Four patients were alive but showed evidence of local recurrence or metastasis to the spine Seventeen were living and apparently well As to the matter of urinary control twenty-eight patients had good control three poor four none In three cases it was not noted The patients living and well without evidence of carcinoma were as follows six less than one year four from one to two years one from two to three years three from three to four years two from four to five years and one for six to seven years Excluding the patients who died as the immediate result of operation or those who died in the hospital 44 7 per cent were probably cured which is a remarkably fine percentage and compares very favorably with Dr Young s 53 per cent I believe this also shows without any question that the operation is capable of being performed on elderly men with low mortality and with few complications If the two eighty-year-old men who died were excluded from the series the mortality would have been only 2 3 per cent

Hinman described four cases of carcinoma of the prostate in which radical perineal prostatectomy was performed with good results One patient was well ten years after operation

Rolnick reported twelve patients with carcinoma of the prostate treated by radical perineal prostatectomy in six of whom the lesion was known to be too advanced for cure at the time of operation Of the other six patients four of whom could be classed as early cases five were followed Of these three were apparently well with practically complete urinary control two of six and fifteen months after operation Of the other two one had only partial incontinence but felt well The other showed evidence of recurrence

The preceding facts indicate that the radical operation for

the majority of cases Cure can be expected in a high percent age certainly 50 per cent Many of the patients in whom re currence and metastasis subsequently develop are not bothered by urinary obstruction and are infinitely more comfortable than they would have been under other types of surgical management

INCIDENCE OF EARLY CARCINOMA OF THE PROSTATE AND PATHOLOGICAL DATA

Carcinoma of the prostate has been studied intensively from a pathologic standpoint during the last few years, the results confirming early impressions as to its frequency and characteristics

Rich reported in 1935 that in 292 consecutive autopsies on males, fifty years of age or more who died from various causes carcinoma was found on examination of one routine microscopic section taken from the prostate in forty one cases, or 14 per cent In 34 2 per cent the disease had been recog nized clinically but in 65 8 per cent the lesion had not been recognized because it was too small to produce any symp toms or to have been noted on routine rectal examination There is little doubt that if more sections had been taken from the gland in each case more cases of carcinoma would have been discovered Rich was of the opinion that the disease almost invariably began in the posterior portion of the pros tate just beneath the capsule

In a similar study by Moore made on 375 consecutive autopsies on males 242 being over forty one years of age, there were fifty two cases of prostatic carcinoma in which the clinical diagnosis was not made There was no distant metas tasis and the disease was limited to one anatomic lobe of the prostate In no case was carcinoma found in patients under the age of forty one years An additional eleven cases with manifest carcinoma of the prostate were included, making a total of sixty three cases of prostatic carcinoma occurring in 242 prostates This is an incidence at autopsy of 21 per cent of occult carcinoma in individuals more than forty years of age or 25 per cent including the cases of manifest carcinoma —a surprising percentage

In fifty two cases the lesions were small and an accurate

determination of the point of origin could be made Fifty, or 73 5 per cent arose in the posterior lobe six or 8 8 per cent, in the lateral lobes, ten or 14 8 per cent in the anterior lobe, none was observed in the middle lobe In two cases the lesion arose in an area of benign enlargement In all other cases the carcinoma was found to be surrounded by glands typical of senile atrophy Moore believes that carcinoma of the prostate in the vast majority of cases results from stimulation and autonomous proliferation of epithelium which has already undergone atrophy

Another point of interest is that in this series, carcinoma was found much more frequently in the prostate than in any other organ the next most frequent being the stomach The incidence of carcinoma of the stomach was 6 2 per cent as compared to 16 7 per cent for the carcinoma of the prostate In fifty two cases there were no clinical or gross pathologic signs of prostatic metastasis In four invasion of the seminal vesicles was found on microscopic examination These four had the largest tumors of the fifty two Moore said ' Viewed from the viewpoint of the general problem of invasion and metastasis carcinoma of the prostate exhibits early invasion of the perineural lymphatics within the organ but metastasis and invasion outside the organ is a late manifestation of the disease Moore noted also that the process is not infrequently multicentric In fifty two cases lack of invasion of the entire or major portion of the gland made possible a determination of sixty-eight areas of malignant disease

A more recent study by Kahler is based on the study of 195 cases of carcinoma of the prostate in seventy two cases the diagnosis was made clinically in the remaining 123 cases the diagnosis was made at postmortem examination The clinical diagnosis was made by rectal palpation alone in twenty three cases and was supported by biopsy in thirty additional cases The incidence of prostatic carcinoma in men fifty years or older was estimated to be 17 3 per cent from the study of this series In ninety six cases the tumor was small enough to be restricted to one lobe of the gland In 6 per cent of the cases the tumor occurred in the anterior lobe in 48 per cent in the lateral lobe and in 46 per cent in the posterior lobe None was found in the median lobe This author called attention to the early

and almost universal local involvement of the perineural lymphatics

These facts present a challenge to the medical profession—a challenge to make an early diagnosis and to treat patients by a radical procedure while the disease is still localized and cure can be expected   They show that carcinoma of the prostate is probably the most common type of carcinoma affecting the ageing male   since apparently in men over the age of fifty years carcinoma of the prostate can be expected to develop in one out of four or five   In fact it also that carcinoma orig inates in a small microscopic area sometimes more than one in the vast majority of cases beginning in the posterior or lateral lobes of the gland in a particularly favorable position for palpation   In many cases the lesions are relatively slow growing and most pass through a stage when a radical pro cedure can be carried out with expectation of cure   Of course carcinomas arising in the anterior lobe or the anterolateral portion of the lateral lobes would be almost impossible to diag nose at an early stage   but these cases are definitely in the minority as proved by the careful localization of early tumors

We know also that all carcinomas of the prostate are not of the same degree of malignancy   It would probably be too much to expect to diagnose early or to operate with expecta tion of cure in cases of rapidly growing relatively undifferen tiated carcinomas of the prostate   We believe however that the majority of cases of carcinoma of the prostate are slow growing well localized at first capable of being diagnosed by virtue of their characteristic stony hard induration and capable of being cured if they are diagnosed in time   In spite of the fact that the diagnosis of carcinoma can be made in the majority of cases while the disease is confined to the pros tate only a few more than a hundred patients have been sub jected to a radical attempt at cure when probably thousands of patients with carcinoma of the prostate are being seen and treated every year   Surgeons and urologists are content merely to relieve urinary obstruction or to use deep roentgen therapy which at most is merely palliative   Progress is not to be made by such procedures   Early diagnosis fearless and radical sur gery have been demonstrated to produce an exceedingly high percentage of cures and should be used whenever possible

DIAGNOSIS

Early diagnosis is the key to the problem and careful rec tal examination is the only possible way of making it When one stops to consider that at least one out of every five indi viduals presenting themselves because of symptoms of urinary obstruction has carcinoma of the prostate and that in the gen eral male population over fifty years of age one of five or six has or will have carcinoma of the prostate, every male patient in this age group should have a rectal examination whenever it is possible The general practitioner must take it upon him self to do this and impress upon the patient the necessity of seeking a urologist s opinion when a suspicious area is en countered

As to rectal examinations, I think much more careful train ing in the technic and interpretation of rectal findings is needed in medical schools and on hospital services It has been my experience that many physicians do not have even an accurate conception of the normal prostate and seminal vesicles and that the usual impression even as to the size of the gland may be wrong In order to make a thorough rectal examination the patient should be as comfortable as possible and the ex aminer should be at ease The best position is with the pa tient standing bent forward from the hips the examiner being seated on a stool behind him Rectal examination in bed is generally unsatisfactory A thorough rectal examination takes time It is not sufficient to quickly palpate the gland I have seen my former chief Dr Young spend several minutes care fully palpating the prostate vesicles pelvic walls and mem branous urethra before he was satisfied that he had a correct impression of the findings I have seen him make a diagnosis of carcinoma of the prostate and prove it at operation in the presence of a small nodule which would not have been noticed by most examiners

The gland must be carefully palpated and considered in regard to size outline consistency symmetry and nodularity _____ ld be pa d to small nodules which may and often _____ Any induration or nod _____ red suspicious Differen tial diagnosis rests between a localized fibrotic inflammatory process, cyst, tuberculosis calculus phlebolith and carcinoma

Calculi can be easily ruled out by roentgenologic examination if the pelvis is tilted so that the prostate will be outside the shadow of the symphysis pubis Tuberculosis can usually be excluded on the basis of symptoms and associated disease Differentiation between an inflammatory process cyst and carcinoma will usually necessitate perineal exposure and biopsy under vision Needle punch biopsy in the hands of the skillful pathologist may yield sufficient information but in the presence of a small suspicious area biopsy under vision will be far more reliable since it is difficult to locate such a nodule accurately with a needle thrust in through the perineum

Of course not all carcinomas of the prostate can be diagnosed at an early stage due to their point of origin in the anterior lobe or far anteriorly in the lateral lobes but these would certainly constitute not more than 20 per cent Occasionally due to the diffuse type of growth and the lack of significant induration striking enough changes may not be produced to suggest the diagnosis of carcinoma In most cases however there is no doubt about the diagnosis If the profession will adopt the attitude that a suspicious area is carcinoma rather than hoping that it is not much can be accomplished

In the last ten years since the general adoption of transurethral methods for relieving prostatic obstruction there is no doubt that the handling of obstruction due to extensive carcinoma is much simpler and that the patient s life is prolonged and made more comfortable Since it is so satisfactory from this viewpoint we have in general been blinded to the chief function of any physician or surgeon namely to cure if possible Needless to say most urologists have not paid as much attention to the possibility of carcinoma since in their hands treatment would be the same anyway transurethral resection It should be noted also that the diagnosis will not be made pathologically unless the carcinoma has invaded the peri urethral tissues and even then it may be missed unless each piece of tissue removed by the resectoscope is sectioned I am sure that because of this many patients with carcinoma of the prostate are discharged from the hospital without a diagnosis being made at a time when they could be cured

Transurethral resection and deep roentgen therapy should

be reserved for patients with extensive carcinoma or those in whom radical operation is contraindicated by virtue of some other disorder

CHOICE OF CASES

Choosing cases may be difficult in some instances but in general a good rule is this   When the extent of induration is confined within the capsule of the gland and without extension about vesicles or involvement of the rectal wall and when no metastasis can be demonstrated the radical operation should be performed   Even when there is well localized involvement of one vesicle the operation can still be done if not with expectation of cure at least with complete relief of urinary obstruction   In these cases in which there is some remaining tumor left in the pelvic tissues if roentgen therapy is of any value adequate treatment could be expected to keep in check the growth of the remaining tumor and perhaps retard the development of metastasis for some time   Tiny nodules of carcinoma found at biopsy may in some cases as described by Young be treated and cured by excision as by doing a hemi prostatectomy   Biopsy by perineal incision is an almost innocuous procedure and if no carcinoma is found and prostatectomy is not indicated the wound heals in a few days

The radical operation is not a particularly difficult operative procedure   The mortality and morbidity are low   Witness the thirty seven patients of Dr Young with one death   and Dr Smith's three deaths in forty two patients two of whom were more than eighty years of age

THE TECHNIC OF THE RADICAL OPERATION

The technic employed follows very closely that described and illustrated so many times by Young   Spinal anesthesia is the anesthetic of choice   The Young table providing a satisfactory position with elevation of the pelvis extreme flexion of the thighs *with the patient held in a fixed position, is desirable but not absolutely necessary*

Familiarity with perineal anatomy and the technic of prostatic dissection is necessary but is not difficult to acquire

After the patient is anesthetized and placed in position on the Young table the operative site is cleansed and draped

The operation is begun by placing a sound, usually size 22 French, in the urethra to act as a guide during the subsequent dissection This is held by an assistant on the operator's left A curved, inverted "U" incision is then made around the anus the two ends of the incision spaced a little wider and carried a little farther posteriorly than in the case of an incision for benign prostatectomy, to give more exposure   The ischio rectal fossae are developed on both sides, taking pains to stay behind the transverse perineal muscles in order not to injure the muscles and nerves about the external sphincter of the

Fig 265 —Sagittal section through male pelvis. The shaded portion represents the structures removed by radical perineal prostatectomy

urethra   The central tendon is undermined and then divided sharply, exposing the anterior rectal attachments to the urethra
At this point one may either dissect out the recto urethralis muscle in the midline and sharply divide it, which then allows one bluntly to dissect the rectum off the membranous urethra and apex of the prostate (Fig 266), or strip away the levator muscle on one side and approach the prostate posterolaterally, stripping the rectum back by careful blunt dissection until the periprostatic fascia is exposed From this point the rectum is stripped back bluntly, dividing sharply the midline structures as necessary When there is no question about the diagnosis and one wishes to make the operation as radical as possible,

the rectum can be bluntly dissected from either one of these approaches without entering between the layers of Denonvilliers fascia thus staying well outside the probable extension posteriorly of the malignant process This procedure is actually done in many cases in which it is difficult to establish a plane of cleavage The risk of rectal injury is greater but need not occur if care and slow dissection are adhered to

During this dissection it is helpful to insert the long seminal vesicle tractor of Young into the bladder through the urethra which will then allow the operator to lever the prostate up into the operative field and give a fixed support against
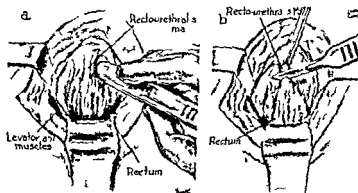
Fig 266—a The central tendon of the perineum has been divided The operator is shown carrying out a blunt dissection of the recto urethralis muscle b Blunt dissection completed The muscle is being sharply divided

which to work When biopsy is planned it is better to make a conventional exposure establishing a plane of cleavage between the layers of Denonvilliers fascia (Fig 267 a) This cleavage plane develops easily exposing a smooth surface and aids in recognizing early changes such as a small nodule or a firm portion much is difficult to outline This dissection is carried back to the base of the vesicles which may be easily palpated for evidence of tumor

If a biopsy is performed and shows carcinoma or if there is no question about the diagnosis then one must determine whether the operation is possible at this point Usually pre-

operative rectal examination establishes this point, but occasionally when operation is done, not with the hope of cure, but for relief of obstruction and palliation (conservative perineal prostatectomy), one may find that the radical operation is
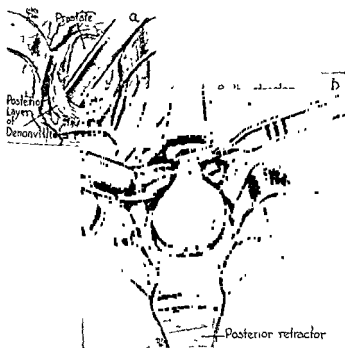
Fig 267—*a*, The rectum has been stripped away from the posterior surface of the prostate and is now covered by a retractor. The posterior layer of Denonvilliers's fascia has been incised and *b* is being stripped away from the prostate by blunt dissection with the knife handle. The anterior layer of Denonvilliers's fascia is exposed. *b*, The prostate has been widely exposed and the index finger of the operator's left hand has been placed beneath the apex of the prostate and the membranous urethra, which is being divided

feasible after all. In other cases, due to the small area involved, the urologist may elect to do a partial or hemiprostatectomy and unilateral vesiculectomy. This last should be done only when the lesion is obviously very well localized and I believe should generally be discarded for the complete radical

operation As has been pointed out by Moore more than one area of carcinoma is not uncommon

If the radical operation is decided upon the next step is blunt dissection to free up completely the apex and lateral surfaces of the gland This is easily done The seminal vesicle tractor is removed and the apex of the gland and proximal membranous urethra encircled either with the finger or a curved clamp over which the urethra is sharply divided (Fig 267 b) The distal cut end should be caught with one or more sutures so that in the final reconstruction it will be possible to pick up the end of the urethra easily which may other wise retract A short young prostatic tractor is then inserted through the prostatic urethra into the bladder and the blades opened The prostate is bluntly freed anteriorly from its bed up to the bladder neck taking pains to stay well outside its capsule Sometimes there may be some bleeding but none which is difficult to control by a pack held against the under surface of the symphysis pubis The tractor is then turned so that one blade can be felt through the anterior bladder wall and the bladder is incised over it (Fig 268 a) I have found that it is better than to withdraw the prostatic tractor and substitute a tractor carried in through the urethra and out through the cystotomy opening When the two ends are clamped this makes an exceedingly useful tractor which takes up no room at all

The next step consists in completing the division of the bladder neck proximal to the prostate usually 1 to 2 cm (Fig 268 b) I have found that there will be no troublesome bleeding if bleeding vessels in the bladder wall are clamped and transfixed with plain catgut As the lateral portions of the bladder neck are approached the walls should be carefully palpated and if fixed at all or indurated a more radical procedure will necessitate removal of more of the bladder wall There is no need to worry about taking too much bladder as the remaining bladder can later be mobilized and brought down to close the defect As the bladder floor is approached on both sides the interior of the bladder should be searched for the ureteral orifices so that they will not be damaged The trigone is cut across well away from the ureteral orifices but if there is a question of carcinomatous involvement more
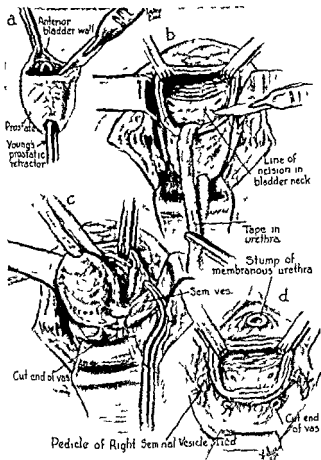
Fig 268—a, Showing Young's prostatic tractor inserted through the prostatic urethra into the bladder and the beginning of the division of the bladder wall proximal to the prostate b, The bladder neck is almost completely divided The dotted line shows the point where the trigone is to be divided c The prostate has been completely freed from the bladder neck and one vas has been divided and ligated The operator is clamping the tissues at the tip of the left vesicle d, The specimen has been removed The cut end of the membranous urethra the remaining bladder the cut ends of vasa and the tied vascular pedicles of the seminal vesicles are shown

trigone may be taken than is usually removed (Fig 268, b)
The trigone and bladder wall should be cut through, and then

by blunt dissection pushed upward leaving as much connec tive tissue about the vesicles and vasa deferentia as possible In this way the vasa and vesicles can be easily exposed as high up as one wishes without injury to the ureters, which will be pushed upward with the bladder floor If there is any concern about this the lower portion of the ureters should be catheter ized to be sure of their position

Following this the vesicles are bluntly dissected with as much connective tissue as possible laterally up to their tips
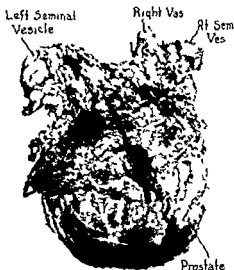
Fig 269—Specimen removed Note that the vesicles have been removed intact

The better method is to free up one vesicle at a time doubly clamping dividing and ligating the corresponding vas as high as possible then from the posterior surface incise the anterior layer of Denonvillier s fascia overlying the vesicles slip a curved clamp up and about the tissues at the tip of the vesicle and divide the vesicle attachment distal to the clamp (Fig 268, c) The tissue remaining in the clamp should be trans fixed The other vas and vesicle are then dealt with in the same manner and the specimen is free (Fig 269) Any bleed

ing should be carefully controlled because I believe that re
tained blood clots in the perineal wound have much to do with
subsequent infection

There remains the problem of performing the anastomosis
between the cut ends of the membranous urethra and the blad
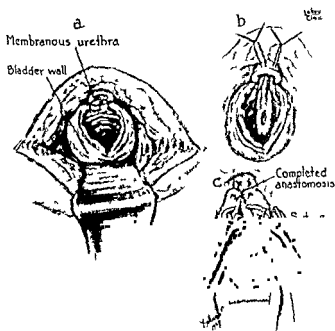
Fig 270—a Anastomosis of membranous urethra to anterior bladder wall
by using one anterior and two lateral sutures b Catheter inserted through
urethra into bladder Two mattress sutures have been placed to approximate
bladder wall to floor of membranous urethra completing the anastomosis
c The floor of the bladder is being closed using the boomerang needle Inter
rupted chromic sutures (No 1) are used

der neck This is really very simple First the bladder neck
should be mobilized enough to give sufficient bladder wall to
be brought down without tension A catheter should then be
introduced into the urethra I believe a small, Foley bag re
tention catheter is preferable to a straight rubber catheter
since perfect drainage is assured and adjustment of the catheter
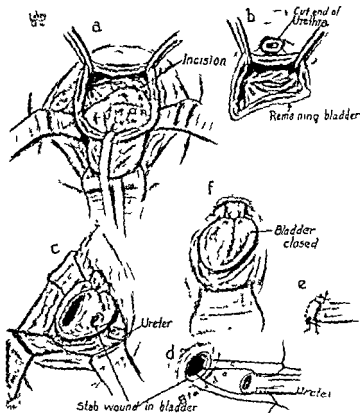
Fig 271—*a* Tumor of bladder shown involving the vesical orifice in zone and region of the left ureteral orifice A conventional radical operation has been carried out up to this point The dotted line shows the level at which the floor of the bladder is to be divided removing all of the prostate bladder wall about the right ureteral orifice and all of the trigone except the point at which the right ureter enter the bladder *b* Bladder remaining after excision of tumor *c* Anastomosis of remaining bladder to membranous urethra and reimplantation of cut end of ureter into bladder wall *d* Method of implanting ureter in bladder wall by using two fine chromic catgut sutures *e* Implantation completed *f* Final closure of bladder

will not be necessary An anterior suture of No 1 chromic *catgut is then placed in such a way that it approximates the anterior wall of the urethra and anterior bladder wall in the*

midline, and the knot is tied so that it lies outside the bladder lumen (Fig 270)

I believe that incontinence may be caused by using too many sutures or by placing them too deeply into the triangular ligament It is our plan to use only four sutures in performing the anastomosis one anteriorly, two laterally and one posteriorly which is placed as a mattress suture and brings the bladder snugly around the catheter forming the floor of the new bladder neck All these sutures should be simply placed through the membranous urethra and bladder neck except the lateral ones which may include some of the connective tissue laterally The remaining defect in the midline is closed by interrupted sutures of chromic catgut placed through muscle only Care must be taken not to place the sutures too high or too far laterally so that a ureter may not be caught

The Foley bag catheter should then be inflated and adjusted so that good drainage is assured The wound is closed by bringing the levator muscles together in the midline with one or more plain catgut sutures In the last case I placed one suture on each side through the levator and the bladder floor to help anchor the bladder and assist the suture line holding the bladder to the membranous urethra A small protective drain is placed behind the bladder floor and brought out through an angle of the perineal wound This is removed on the second or third postoperative day The skin is closed by interrupted sutures of fine silk

POSTOPERATIVE CARE

The postoperative care of such patients consists in being sure that the catheter drains well at all times If it does a per primum healing can be expected in many cases Often a smoother convalescence than after prostatectomy takes place, probably due to the fact that the usual absorption from the prostatic fossa is done away with The catheter is usually removed by the tenth day although it should be kept in longer (fourteen days) if there is no reaction about it and if the drainage continues to be satisfactory One striking point during convalescence is the fact that patients are comfortable and require very little sedative There is rarely postoperative shock because the operation can be completed in from an hour

and a half to an hour and forty five minutes without any seri ous loss of blood

Complications arising from poor technic at the operating table are retroperitoneal hemorrhage, obstruction to one or both ureters from sutures placed at the operation, and rectal injury Hemorrhage almost never occurs if careful hemostasis is maintained at the time of operation Neither ureter should be damaged if one is careful in the dissection If there is any question, certainly catheters should be passed up the ureters to assure one of their patency before the wound is closed If the rectum is injured it almost always occurs during the dissection of the rectum from the prostate and for this reason the urinary tract should never be entered until the rectum is carefully inspected and found to be intact

Complications from infection are relatively rare although there may be a low grade persistent fever from wound infec tion Upper urinary tract complications should not occur un less renal disease was overlooked prior to operation A per sistent perineal urinary fistula is practically never seen If it occurs the use of an indwelling catheter and careful curet ting of the perineal sinus will result in prompt healing

Postoperative incontinence will be very rare if the external sphincter and the triangular ligament are not injured and if sutures are not placed too deeply in performing the anasto mosis between the membranous urethra and bladder neck Many cases of partial incontinence will clear up spontaneously or after voluntary practice of the external sphincter

EXTENSION OF THE RADICAL OPERATION TO INCLUDE CARCINOMA OF THE BLADDER NECK

Extension of the radical operation to include carcinoma of the bladder arising about the vesical orifice and trigone even with involvement of the ureteral orifices is perfectly feasible and has been carried out by several operators (Deming Shaw Young) In such cases all or part of the prostate including the vesicles and the involved portion of bladder wall is re moved If one of the ureters is involved it may be divided and remanted into the bladder wall as shown in Fig 271 This was carried out in one of my cases without difficulty The subsequent restoration of the vesical neck and bladder was

surprisingly easy   Convalescence was somewhat delayed as
a result of infection intensified by a large diverticulum of the
bladder   There is now slightly more hydronephrosis on the
side involved but the patient is well without complaints a year
after operation   Check up cystoscopy shows no evidence of
recurrence of tumor within the bladder   Rectal examination
reveals no induration in or about the bladder base   The blad
der capacity as shown in the cystogram is excellent   The pa
tient has complete urinary control   This case is to be reported
in detail later

I have carried out in the last year four radical operations,
three for carcinoma and one for carcinoma of the bladder neck
with involvement of the prostate, without an operative death
It is, of course too soon to evaluate results, although all pa
tients are living

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THE TECHNIC OF VAGINAL HYSTERECTOMY

Herbert D. Adams

Vaginal hysterectomy is the operation of choice in certain selected cases of uterine prolapse If the proper technic is carried out excellent results are obtained It is simple safe and produces very little shock or general reaction It is therefore indicated particularly in the group of elderly patients with nonmalignant conditions associated with prolapse One of the chief advantages of this operation is the minimal visceral and peritoneal trauma Of great importance also is the absence of the profound systemic disturbance that a laparotomy is certain to produce to some degree in elderly patients These patients resume normal cardiovascular respiratory renal and gastro intestinal function and are able to move about in bed and manage themselves very early in the post operative period

The most ideal subject for vaginal hysterectomy is the elderly individual with long standing marked prolapse Many of these patients fearing operation at their age have endured the constant discomfort irritation and bladder symptoms and have finally come to the physician for treatment only when chafing and constant irritation have produced superficial ul ceration and blood staining The association of vaginal bleed ing after the menopause with carcinoma has been well im pressed on the laity and these patients eventually seek treatment Vaginal hysterectomy is certainly the procedure of choice for this type of patient who is in the sixth seventh and *eighth decades of life* *They stand the procedure well from* a general standpoint and it satisfies the clinical aspects per fectly Even though careful curettage does not reveal malig nancy and no definite cause of the bleeding can be demon strated in this age group the uterus should be removed

It is also a well recognized fact that in order to get good and permanent results from operations for repair it is essential to do something with the uterus itself Three procedures are available for adequate repair (1) anterior and posterior colporrhaphy, with or without amputation of the cervix and perineorrhaphy and followed by laparotomy and ventral fixation, (2) Watkins Wertheim interposition operation with or without amputation of the cervix, and perineorrhaphy, and (3) vaginal hysterectomy with interposition of the broad ligaments and perineorrhaphy The latter two operations due to their greater safety and their definite advantages from a general standpoint, are the procedures of choice in the group of patients under consideration The Watkins Wertheim interposition operation with amputation of the cervix and perineorrhaphy is probably the operation of choice for patients of this group when there is no abnormal bleeding and when the uterus is normal the prolapse not extreme and when there is moderately good support of the lower uterine segment If there has been abnormal bleeding or if the uterus is not quite normal on examination and carcinoma has been excluded or if there is an extreme degree of prolapse vaginal hysterectomy with interposition of the broad ligaments and perineorrhaphy is the operation of choice The only actual technical contraindications to this procedure are previous pelvic operation which included suspension or a very large uterus

Many surgeons do not employ vaginal hysterectomy because they believe there is a greater chance of injury to the urinary tract or greater difficulty in securing adequate uterine blood supply than with other operations proper technic however, removes these problems and the operation is just as safe and as accurate as abdominal hysterectomy A routine standardized operation has been worked out in detail to conform with sound surgical principles The entire procedure is done under direct visualization and easy and adequate control of the uterine blood supply at all times

These patients should be kept in the hospital for at least twenty four hours or longer before operation for any general preparation and if there is marked edema congestion or ulceration from the prolapse for local treatment in preparation of the operative field With the patient under general anes

thesia or preferably spinal anesthesia the perineum and vag
inal mucosa are carefully and thoroughly prepared with iodine
solution and the patient is catheterized and draped   The
uterus and pelvis are carefully palpated and curettage is done
to rule out carcinoma   Traction is then made on the cervix
bringing the uterus down and backward as far as possible and
exposing the associated cystocele   A midline vertical incision
is made through the vaginal mucosa from the cervix to within
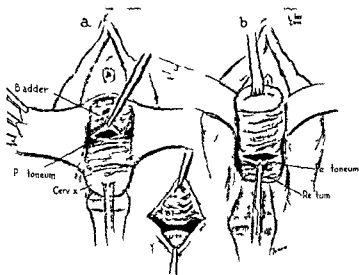
Fig 272 — a Bladder dissected from anterior surface of cervix   peritoneum
of anterior cul-de sac opened   b Rectum dissected from posterior aspect of
cervix   peritoneum of posterior cul de-sac opened

2 cm of the urethral orifice   The mucosa is raised from the
bladder and urethra and the dissection is carried laterally to
expose the ramus of the pubis on either side   The bladder is
then freed from the anterior surface of the uterus stripping it
upward and exposing the peritoneal reflection in the anterior
cul de sac   This peritoneum is opened exposing the fundus
of the uterus   Traction on the cervix is then directed forward
toward the pubis exposing the posterior aspect of the cervix
(Fig 272)

The mucosa encircling the cervix is divided and the rectum is stripped from its posterior surface until the peritoneal reflection in the posterior cul-de-sac is exposed and then opened The fundus is acutely anteflexed through the peritoneal opening in the anterior cul-de-sac and grasped with a double hook The fundus and cervix are drawn to the right, by placing the finger in the opening in the peritoneum in the posterior cul de sac, the left broad ligament can be palpated and clearly visualized throughout its entire length (Fig 273) Mattress sutures of chromic catgut, left long and placed close to the
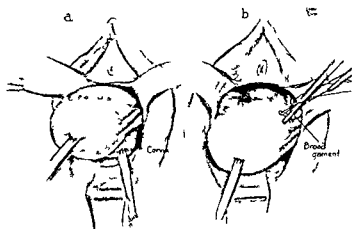
Fig 273—*a* Fundus anteflexed through peritoneal opening in anterior cul de sac *b* Mattress sutures being placed in broad ligament close to uterine wall

uterus to avoid the ureter control the uterine vessels and anastomotic ovarian branches and the uterus is severed from this broad ligament The uterus is then laid back, giving an even better exposure of the opposite broad ligament (Fig 274) The blood supply is controlled with similar mattress sutures and the uterus is totally removed

The tubes and ovaries are inspected at this point and can be removed if diseased

The next step of importance and one which is often omitted is careful closure of the peritoneum to form a new, completely
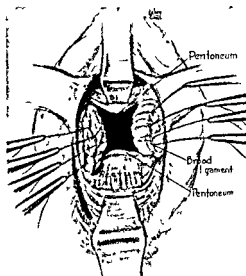
Fig 274—Uterus totally removed cut ends of broad ligaments held
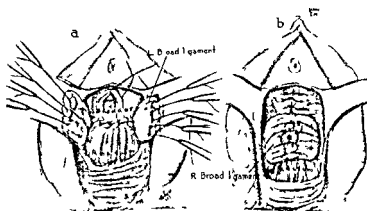
Fig 275—a Peritoneal reflections from bladder and rectum closed transversely bladder plicated b Broad ligaments sutured together beneath new peritoneal floor

peritonealized pelvic floor This is accomplished by uniting the peritoneal reflection off the bladder anteriorly with that

off the rectum posteriorly allowing the broad ligaments to
come through the angles on either side (Fig 275 a)

If the bladder and urethra are particularly patulous they
are carefully plicated with fine sutures at this point (Fig
275 b) The exposed ends of the broad ligaments are then
sutured together in the midline beneath the newly constructed

F 275—a and b An ero te borders of broad l gamen u u ed to pub ram
on e the s de of u ethra   and d E cess muco a ex t d and mu osa closed

peritoneal floor and their anterior borders are sutured with
        t m   a m   on e the s de of the urethra to the fas
                                                         road
                                                         lent
                                                         the
support b
anterior vaginal wall closed with interrupted sutures

The mucosa on the posterior wall of the vagina is freed

a Mucosal triangle of vagina resected

b Fascia over rectum
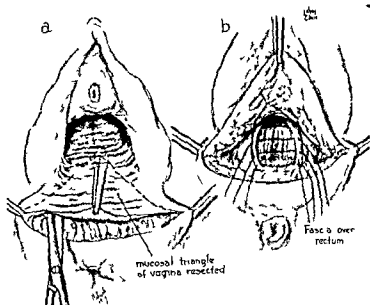
Fig 277 —a Mucosa freed from rectum b Pelvic fascia sutured over rectum

a Levator ani muscles

b Levator ani muscles

Transverse perineal ms. second layer 1st layer
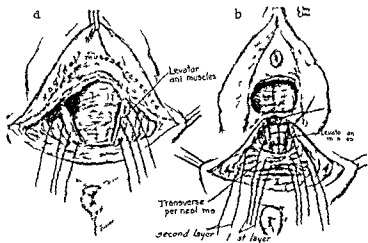
Fig 278 —a Levator ani muscles sutured b Transverse perineal muscles sutured

from the rectum carrying the dissection from the perineum almost to the height of the anterior dissection (Fig 277) The levator muscles are carefully visualized and united as high as possible The transverse perineal muscles and perineum are built up to form a strong flat support for the anterior wall which is one of the most important factors in obtaining a good permanent support of the bladder (Fig 278) A triangular portion of the mucosa is excised and the posterior vaginal mucosa closed with interrupted catgut sutures The perineal skin is closed with subcuticular fine catgut sutures to prevent the
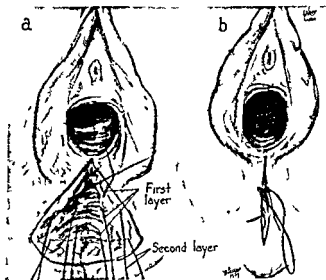
Fig 279—a and b Perineal repair completed

irritation produced by exposed sutures in this region (Fig 279) A single gauze sponge is placed in the vagina to produce light pressure for hemostasis and this sponge is removed in twenty four hours Constant drainage of the bladder is instituted and the perineal dressing applied

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THE MANAGEMENT OF CARCINOMA OF THE CERVIX UTERI

Hugh F. Hare

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The management of carcinoma of the cervix uteri depends mainly upon three factors (1) the host of the disease (2) the extent of the disease in the host at the time the patient is admitted for diagnosis and treatment and (3) the type of lesion It is upon these three factors that one must depend in determining the type and amount of treatment which each individual patient must have

... the most important ... have to deal has not been successfully approached on a scientific basis It is impossible to explain why one patient with carcinoma of the same extent of the same duration and with the same pathologic picture as a second patient will respond to radiation therapy or to operation while the second one will die of carcinoma Experience teaches us little in judging the ability of the host to respond to treatment

The problem of the extent of the lesion at the time the patient comes for treatment has been successfully attacked A world wide classification has been developed in order that we may, after a period of years study our records and determine the extent of the disease and in order that physicians whether using operation or radiation will be able to compare results of treatment This classification is as yet so new that it is impossible to have five year results in a large group of cases other than in medical centers The classification as es tablished by the American Radium Society divides the extent of the disease affecting the cervix and surrounding tissue into various stages as follows

Stage 1   The growth is strictly limited to the cervix uteri

Stage 2   Lesions which have spread into one or more for nices the uterus retaining some degree of mobility

Stage 3   (a) Nodular infiltration of the parametrium on one or both sides and extending to the wall of the pelvis with limited mobility of the uterus

(b) Isolated metastases in the pelvic glands with a rela tively small primary growth

Stage 4   (a) Cases in which massive infiltration of both parametria is present extending to the walls of the pelvis with fixation

(b) Carcinoma involving the bladder or rectum

(c) 1 More or less superficial infiltration of a large part of the vagina with a mobile uterus

2 Isolated metastases in the lower part of the vagina

3 The whole vagina infiltrated (rigid vaginal passage) or one vaginal wall infiltrated along its entire length with fixation of the primary growth

(d) Remote metastases

This classification is quite complete and workable for all cases and although some cases are borderline in the long run a mean average will be struck.

The third most important factor with which we must deal is the macroscopic and microscopic type of disease with which the host is afflicted Ninety seven per cent of all malignancies of the cervix are of the epidermoid type The remaining 3 per cent are adenocarcinomas The microscopic picture by which the epidermoid carcinomas can be divided into slowly growing and rapidly growing types and the one used in this clinic was developed by Dr Shields Warren It is as follows

1 Epidermoid or squamous carcinoma grade I according to degree of anaplasia

Epidermoid or squamous carcinoma grade II

Epidermoid or squamous carcinoma grade III

2 Adenocarcinoma

3 Adeno acanthoma

The most common symptom of carcinoma of the cervix is abnormal bleeding from the vagina between menstrual periods or after the menopause However in the early cases the bleed ing is slight it may or may not be accompanied by a vaginal

discharge which may be foul or fetid   In order to make an early diagnosis of carcinoma of the cervix uteri each cervix must be carefully scrutinized especially if a history of abnormal bleeding is given and in each case a biopsy must be performed and specimens taken from several areas to rule out malignancy   A biopsy in cases of early or advanced disease may easily be carried out in the office without undue discomfort to the patient   Once the diagnosis is made the three factors are completed and the course of therapy ready to be decided upon

CHOICE OF TREATMENT

During recent years the treatment of carcinoma of the cervix uteri has gradually become a problem for the radiologist regardless of the factors of host the extent or the type of lesion It has been our practice to advise radiation treatment in all cases except for epidermoid carcinomas of grade 1 stage 1 These tumors are relatively slow growing and are localized to the cervix   They are relatively rare however making up only 10 per cent of the total cases of malignancy of the cervix thus leaving at least 90 per cent of all tumors to be treated by radiation   Radium therapy alone may be successfully used when the lesion is localized to the cervix   Once the disease has spread beyond this area roentgen treatment must be used in addition in order to deliver a uniform tissue dosage to the tumor bearing area

In all cases we believe that irradiation should be delivered externally previous to the application of radium because (1) the peripheral growth in the adnexa receives the major portion of radiation effect from roentgen rays (2) there is a low grade secondary infection present when the patient comes for treatment and during the course of roentgen treatment the infection may be cleaned up and (3) the primary tumor decreases in size and the host usually improves physically so as to better withstand radium treatment   It has been our experience that the complications such as pyometria parametritis or thrombophlebitis accompanying treatment of cancer in this location occur less commonly when roentgen treatment precedes the application of radium

COMPLICATIONS OF TREATMENT

The complications of radiation treatment may occur in one of several places   In delivering irradiation to the pelvis in large enough quantities to destroy malignant cells in the cervix and adnexa, the skin and subcutaneous tissues receive large quantities of roentgen rays and must be protected as carefully as possible by giving heavily filtered radiation in large quantities to the tumor and tumor bearing area and in as small quantities to each skin area as possible   This may be attained by treating through several skin areas daily, directing the course of the treatment toward the cervix   The skin complications are radiation dermatitis, radiation telangiectasis and radiation ulceration

The bladder lies in the field of radiation and receives large doses of the rays both with the external radiation and with radium, although it should be shielded from the radium as much as possible   Bladder complications may occur early or late   They are catarrhal cystitis and vesicovaginal fistula   The latter occurs when a tumor has invaded the bladder and enough radiation has been given to destroy the tumor   The late complications are chronic ulcerations of the bladder, bladder necrosis and vesicovaginal fistula as a result of heavy radiation

The rectum and lower part of the rectosigmoid lying in the direct field of radiation may also be affected pathologically   ~~...~~ are symptoms following either radium or

the bowel

It is natural to assume that since the vagina also is in the field of direct radiation it will be affected by the roentgen rays and by radium most frequently by radium   The most common complications are stenosis and chronic ulceration

Complications of roentgen and radium treatment cannot always be avoided but the experienced operator may give radium or roentgen rays in small repeated doses until the treatment is sufficient to destroy the tumor and do away with the serious complications   providing filtration has been adequate

RADIATION TREATMENT

As has been stated previously, roentgen radiation is used previous to radium treatment in order best to control the peripheral tumor invasion and secondary infection

The roentgen treatment given at the present time is as follows K V P 200 Ma, 20 distance 50 cm , filter, 1 mm copper and 1 mm aluminum added 0 25 mm copper inherent in the tube portal size 15 cm round cone, r unit, 100 "r" units daily to four skin portals to give approximately 133 "r" units daily to the tumor bed The skin portals are as follows (1) Two anterior abdominal portals one on each side of mid line the crest of the pelvis marks the upper limit of the skin portal and the symphysis pubis marks the lower level of the skin portal The rays are directed anteroposteriorly (2) Two posterior oblique portals directing the roentgen rays between the head of the femur and the sacrum with approximately a 15 degree tilt cephalad in order to direct as large a quantity of the rays into the tumor area as possible (3) In some patients weighing more than 150 pounds lateral portals may be added to increase the amount of radiation The added depth dose gained by using these portals is small and should not be used unless necessary (4) A perineal portal Roentgen treatment through this portal gives rise to considerable discomfort associated with pain and swelling of the vulva It has been abandoned except in cases of vaginal involvement

A dose of 2 000 r units is delivered to each skin portal to give a total of 8 000 r units to the external pelvis in a period of twenty treatment days

Radium or radon treatment is instituted three to six weeks following the roentgen treatment and this likewise is administered in divided doses first in order to obtain as uniform radiation to the tumor area as possible and second to prevent the complications discussed any of which may result if radium is administered too rapidly Our purpose is to deliver 6 000 mg hr of radium screened through at least 2 mm of lead, during the hospital stay

The application of radium in the treatment of this disease *requires more knowledge of the physics of radiation than is* the case with tumors in most areas due to the necessity for treating the tumor tissue uniformly without producing injury

to the bladder or bowel or surrounding normal tissue The
radium must be applied with as little trauma as possible, not
only to prevent the spread of disease, but to prevent inflam
matory reactions in surrounding tissue   Thus it may be seen
that several applications of radium are a necessity and each
application must be made with care   After the radium is placed
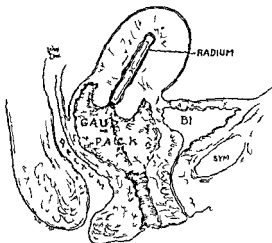
Fig 280—Method of packing vaginal vault so as to separate the rectum and
bladder from the cervix during period of application of radium

in position it is equally important to protect the surrounding
tissue as much as possible from the radium by gauze packs
(Fig 280)   The gauze packs may be changed daily, which
will cause considerable irritation to the vagina, or gauze packs
impregnated with glucose may be used and the packs left in
place during the period of radium application

INDICATIONS FOR DIRECT LARYNGOSCOPY
AND BRONCHOSCOPY

W. B. Hoover

THE indications for direct laryngoscopy and bronchoscopy are in short (1) when examination cannot be made completely and satisfactorily without the use of the laryngoscope and bronchoscope and (2) when treatment or manipulation in the larynx and bronchial tubes is indicated after a diagnosis has been made or when tissue is to be removed to establish a diagnosis Direct laryngoscopy and bronchoscopy make visualization and accurate manipulation possible in an otherwise inaccessible region

When indirect laryngoscopy or mirror laryngoscopy fails direct laryngoscopy is used It is necessary for infants and small children because cooperation between the examiner and patient is lacking Force becomes necessary and the direct laryngoscope renders the larynx clearly visible in practically all cases The most common abnormal findings in children are inflammatory lesions edema secretions and false and true membranes In such cases the laryngoscope is used for taking cultures directly from the larynx and for placing an intubation tube when the airway is inadequate

Papillomas which are frequent in children are easily recognized and treated by repeated removal with visualization through the direct laryngoscope Foreign bodies are likewise seen and removed and webs may also be seen and treated Paralysis and deformity are occasionally encountered

Indirect laryngoscopy should always precede direct laryngoscopy when cooperation of the patient will permit It has the advantage that function can be studied better without the presence of an irritating instrument near the larynx and motion is natural The information gleaned from the indirect examination permits the operator to be prepared for manipula

tion or treatment which is to be carried out during direct laryngoscopy, thus shortening the time and making the manipulation more accurate

The experience and ingenuity of the physician using the indirect method for examination and operations may curtail the necessity for direct laryngoscopy. The indirect method compared to the precision of direct laryngoscopy with the laryngoscope and the suspension laryngoscope is much the same as the horse and the buggy compared to modern transportation

There are three types of direct laryngoscopes in common use. First there is the direct laryngeal spatula this is usually electrically lighted and is held in the left hand of the operator, leaving his right free for instrumentation. With such an instrument the larynx can be quickly exposed without anesthesia with local anesthesia or with general anesthesia. This instrument has many modifications to meet the various problems in laryngeal work as well as to satisfy the whims of the individual user. It is the instrument most commonly employed for examinations and biopsy because of its ease of use speed and simplicity

A second type of instrument the suspension laryngoscope which has a spatula that may be adjusted to the larynx and also has counter pressure on the palate and teeth hangs from an adjustable gallows. This instrument affords an excellent view of the larynx and permits the operator to use both hands during operation. The use of this instrument requires general anesthesia and it takes more time to adjust. This time is well spent however in the more difficult cases in which operative removal of a growth is undertaken and it is the instrument of choice in such cases

A third instrument called a directoscope is a bivalve laryngeal speculum. One blade is placed under the epiglottis and the other has a plate which is placed on the posterior pharyngeal wall that is on the anterior surface of the cervical vertebrae. Counter pressure is obtained on opening the speculum. This instrument is satisfactory in many cases and can be used with both local and general anesthesia. It leaves both hands free for manipulation. My experience with this instrument is limited. I depend on the direct laryngoscope and on the suspension laryngoscope

Lack of cooperation in adults occasionally necessitates direct laryngoscopy. The most common failure of complete visualization of the larynx by mirror in the adult, however, is an over hanging epiglottis which obscures the anterior portion of the larynx. As Dr. C. L. Jackson has frequently pointed out, "Death may lurk under an over hanging epiglottis." The anterior commissure of the larynx must be visualized in all patients with laryngeal symptoms. In some instances it can be visualized by anesthetizing the larynx, placing a retractor over the epiglottis, and by displacing it forward against the base of the tongue. Surely if the anterior commissure of a patient with laryngeal symptoms is not visualized, the examination is incomplete and direct examination must be made. This area is a frequent site of early curable carcinoma.

Direct examination is most often used after indirect examination has revealed a lesion and when further information is needed for diagnosis, treatment is to be given, or an operation undertaken. When paralysis is noted, direct examination and manipulation are used to determine if ankylosis of the crico arytenoid joint has occurred; also, the postcricoid and upper esophageal regions are searched for a lesion that could produce paralysis.

In the case of large tumors, direct examination is used for probing to determine the consistency, fixation, mobility and point of origin. Chondromas are usually solid and firmly fixed tumors; fibromas are usually firm; lipomas and cysts, usually soft. Fibromas, lipomas and cysts are to some extent generally movable.

Direct laryngoscopy is the method of choice in removing foreign bodies both in adults and in children. Cicatricial contracture of the larynx may follow injury, improper tracheotomy, so called "high tracheotomy," intubation, operations, or result from inflammatory disease. Repeated dilatations are often of value in overcoming the contracture and these dilatations can in many cases be successfully carried out by means of direct laryngoscopy.

In adults, vocal nodules or "singer's nodes," are removed with biting forceps or punches from the edge of the true vocal cords, using the direct laryngoscope for visualization. Frequently, excellent results are obtained from such treatment

tion or treatment which is to be carried out during direct laryn goscopy, thus shortening the time and making the manipula tion more accurate

The experience and ingenuity of the physician using the indirect method for examination and operations may curtail the necessity for direct laryngoscopy   The indirect method com pared to the precision of direct laryngoscopy with the laryngo scope and the suspension laryngoscope, is much the same as the horse and buggy compared to modern transportation

There are three types of direct laryngoscopes in common use   First, there is the direct laryngeal spatula this is usu ally electrically lighted and is held in the left hand of the operator leaving his right free for instrumentation   With such an instrument the larynx can be quickly exposed without anes thesia with local anesthesia or with general anesthesia   This instrument has many modifications to meet the various prob lems in laryngeal work as well as to satisfy the whims of the individual user   It is the instrument most commonly em ployed for examinations and biopsy because of its ease of use, speed and simplicity

A second type of instrument the suspension laryngoscope which has a spatula that may be adjusted to the larynx and also with counter pressure on the palate and teeth hangs from an adjustable gallows   This instrument affords an excellent view of the larynx and permits the operator to use both hands during operation   The use of this instrument requires general anesthesia and it takes more time to adjust   This time is well spent, however in the more difficult cases in which operative removal of a growth is undertaken and it is the instrument of choice in such cases

A third instrument called a directoscope   is a bivalve laryngeal speculum   One blade is placed under the epiglottis and the other has a plate which is placed on the posterior phar yngeal wall that is on the anterior surface of the cervical vertebrae   Counter pressure is obtained on opening the spec ulum   This instrument is satisfactory in many cases and can be used with both local and general anesthesia   It leaves both hands free for manipulation   My experience with this instru ment is limited   I depend on the direct laryngoscope and on the suspension laryngoscope

laryngoscope may be used for passing a breathing tube or bronchoscope through the larynx, thus insuring an airway while an orderly operation is performed

The laryngoscope is used for passing the tracheal tube for intratracheal anesthesia, for passing a suction tube when secretions are to be removed from the tracheal and bronchial tube, and for placing lipiodol It is also used for introduction of the bronchoscope

The general indications for bronchoscopy have been mentioned Many physicians are satisfied with what may be an incorrect diagnosis or only partly correct diagnosis and do not take advantage of bronchoscopy to prove the diagnosis, to find the etiologic factor, to make the correct diagnosis, and at times to give treatment that will result in cure For instance, an "abscess" of the lung may be truly only an abscess Yet it may be degeneration of a malignant tumor with cavitation and infection Again, it may be cavitation and infection about a foreign body which might be removed by bronchoscopy Therefore, in many cases of "lung abscess" bronchoscopy is necessary for differential diagnosis In some instances bronchoscopic treatment by aspirating and enlarging the passage by which the abscess drains is greatly beneficial Diagnostic bronchoscopy is indicated in all cases of chronic lung suppurations and in some cases of acute lung infections

Roentgenologic evidence of tumors of the lung is frequently discovered, and in a fair percentage of cases a definite differential diagnosis is possible by performing biopsy and taking a specimen through the bronchoscope Evidence of stenosis of the bronchial tubes is likewise an indication for bronchoscopy The most common causes of bronchial obstruction other than foreign bodies are enlarged glands, inflammatory lesions and new growths (both intrinsic and extrinsic) In some cases marked improvement results from the removal of the obstruction by removing granulation or tumor tissue, or by dilatation A foreign body in the trachea or bronchial tubes can in nearly all cases be removed by bronch~ ~

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only a part of the proce~

~ical problem and the forceps to be used are important In a case in which the foreign body cannot be visualized, fluoro

as far as the voice is concerned   Such patients should also be encouraged to have vocal rest, as improper and over use of the voice seem to be the principal etiologic factors

Small inflammatory growths occur frequently on the vocal cords, and these usually are caused by misuse and over use of the voice in the presence of laryngitis   Some occur suddenly, in the form of a hemorrhagic nodule which is not absorbed   Such a nodule may become organized and fibrotic or vascular   Both sclerosis and vascularity occur, and the nodule may be confused with fibromas and hemangiomas   These tumors are likewise removed from the vocal cords   They may vary in size from 2 mm to 1 cm   True fibromas and hemangiomas are much less common and may be much larger   In such cases, suspension laryngoscopy is especially valuable, and electrocoagulation may be used to control bleeding

Papillomas, although more common in children, also occur in adults   They can be removed with forceps and their bases electrocoagulated   Papillomas may undergo malignant change   All tissues removed from the larynx should be submitted for microscopic study and diagnosis, as it is possible for all growths to undergo malignant change   Leukoplakia and epithelial hyperplasia of the larynx also are prone to malignant degeneration or changes   The vocal cords are usually affected by this condition and the thickened area can be removed under direct or suspension laryngoscopy   Electrocoagulation may be used to destroy every vestige of the thickened area   Here again, the tissues removed must be carefully examined microscopically and should malignant change be noted further operation by the external approach is advisable to remove a sufficient margin of healthy tissue

Direct laryngoscopy has its limitations in the operative removal of large deep seated or malignant growths   Adequate exposure and removal are impossible by this means   Pharyngotomy, thyrotomy, laryngofissure or even laryngectomy, may be necessary

Polypoid growths of the cords   myxomatous masses and prolapse of the ventricles are treated by stripping the excess tissue from its attachments or biting off the protruding tissue with punch forceps

In cases of laryngeal obstruction requiring tracheotomy, the

bronchoscopy   In fact, any unexplained or undiagnosed condition or symptom involving the chest and lungs needs this investigative procedure

Patients with bronchial asthma or asthmatic bronchitis of infectious origin with tenacious secretions are frequently benefited by bronchial aspiration and the instillation of lipiodol Bronchoscopy should be considered when the more common methods of treatment fail to give a satisfactory result

Lipiodol introduced into the bronchial tree before fluoroscopy with the use of roentgenograms makes "visualization" of the periphery as well as of the main bronchial tubes possible and is of tremendous value in the diagnosis of lung and chest disease   The laryngoscope and bronchoscope are of great aid in placing the material

In the use of the laryngoscope and bronchoscope, hasty methods are employed only in emergencies in which the patient's life is at stake because of impending asphyxiation Otherwise, they are used after careful compete examination and are not a short cut to diagnosis   The use of laryngoscopy and bronchoscopy in this manner is a safe procedure

scopic guidance with a biplane fluoroscope is often the answer
to an otherwise difficult problem

Massive collapse of the lung often follows major surgical
procedures on the upper part of the abdomen Lack of power
to expel secretions results in an accumulation within the bron
chial tree The obstruction in time produces atelectasis or
collapse of the lung distal to the obstruction The symptoms
and signs of massive collapse are fairly characteristic They
are increased respiratory rate and effort, respiratory distress
often with some cyanosis an irritating cough with little ex
pectoration and usually some rise in temperature There is
splinting of the affected side of the chest the heart and medias
tinum are displaced to the affected side and the breath sounds
are absent or markedly suppressed The roentgenogram shows
a fairly characteristic picture It is now our practice to per
form bronchoscopy and aspirate the bronchial tubes in such
cases without anesthesia

Aspiration with the marked cough reflex which results
from the presence of the instrument in the trachea and bron
chial tubes empties the bronchial tubes and marked improve
ment results in the symptoms signs and the roentgenologic
findings All patients with postoperative chest complications
should be examined with the possibility of lung collapse in
mind even though the complete picture of typical massive
collapse is not present and the patient is unable to raise and
expectorate excessive secretions Aspiration of such secretions
often results in marked benefit

In cases of inflammatory disease of the trachea and bron
chial tubes in which tracheotomy has been necessary such as
acute laryngotracheobronchitis and the tracheobronchitis fol
lowing the presence of vegetable foreign bodies in the bronchial
tree crusting may take place producing obstruction and
bronchoscopic removal of the crusts is necessary to keep the
air passages open This may likewise occur after laryngec
tomy Likewise if the tracheotomy does not relieve obstruc
tive dyspnea the lower bronchial tree should be searched for
the cause

Hemoptysis that is not clearly accounted for demands
bronchoscopic search for a lesion in the bronchial tree Like
wise an unexplained cough should be carefully investigated by

bronchoscopy In fact, any unexplained or undiagnosed condition or symptom involving the chest and lungs needs this investigative procedure

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TONSILLECTOMY UNDER LOCAL ANESTHESIA·
GENERAL CONSIDERATIONS AND TECHNIC

W B HOOVER

THIS paper is concerned primarily with tonsillectomy, the removal of lymphoid tissue from the base of the tongue and pharyngeal walls, and the removal of the adenoids, under local anesthesia   The method of operation used at the Lahey Clinic is illustrated   Only a general statement is made of the indications for operation

In general, the indications for removal of the tonsils and lymphoid tissue of the pharynx may be divided into two classes   (1) local disease of the tonsil itself, such as recurrent acute infection, peritonsillar abscess, nasal or pharyngeal obstruction and the accumulation of foul secretions and so forth which demand removal, and (2) systemic manifestations, such as arthritis, myositis, renal disease, heart infection, or other evidence of focal infection which points towards tonsillar difficulty   Often a combination of these factors may exist

Old age and even severe heart disease are not a contraindication, for we have successfully removed the tonsils of a woman of sixty three years who was confined to bed for several weeks as a result of cardiac decompensation with each attack of acute tonsillitis   She had been warned against and had refused tonsillectomy because of fear of the operation at her age   After three years of urging, however, she finally consented, and she has now been free from tonsillitis and cardiac decompensation for four years

The presence of an acute respiratory infection, however, is an indication for delaying operation

Many of the patients with systemic symptoms are referred from the medical department of the clinic and have already had a careful general examination   It is important, however,

to rule out diabetes or other conditions that require special preparation of the patient When it is decided that the patient will most probably benefit from removal of the tonsils and lymphoid tissue of the pharynx, operation is indicated

Contraindications to the Use of Local Anesthesia.— There are a few contraindications to the use of local anesthesia Children under the age of fourteen years are not submitted to local anesthesia because of their inability to cooperate and because most children require an adenoid operation as well as tonsillectomy

There are likewise a few patients who have very unstable vasomotor and emotional reactions which they cannot control For instance, I have seen a few patients who fainted at even the thought of a doctor's office or at the mention of an operative procedure even though operation was not to be carried out until several days later Such patients are not asked to undergo operation under local anesthesia

Idiosyncrasy to the drugs used in local anesthesia may be a contraindication, although true idiosyncrasy is extremely rare and I have never encountered it Psychic reactions such as pallor, faintness and nausea however are not uncommon These symptoms often occur before a local anesthetic has been injected, and they can usually be successfully overcome by allowing the patient to lean forward placing the head between the knees A few words of encouragement and reassurance from the operator also are of aid

The temperament of the surgeon may sometimes also be considered a contraindication to the use of local anesthesia in tonsil operations In order to perform tonsillectomy success fully and satisfactorily under local anesthesia the patient and surgeon must cooperate The surgeon must have confidence in his ability so that he may maintain absolute control of the situation at all times He must be patient kind firm and pleasant, and resourceful in meeting problems as they arise Certainly, an irritable temperamental impatient or excitable surgeon should not perform tonsillectomy under local anesthesia

True hemophilia which is extremely rare is a contraindication to operation I have had only one case in which it was necessary to refuse operation because of this condition This

patient gave a history of serious bleeding, and two other members of his family were similarly affected   The history and laboratory examination should rule out this condition

Preparation of the Patient —The preparation of the patient for local anesthesia begins with the rhinolaryngologic examination   The impression made on him at the time of examination is important in gaining his confidence   At this time the patient's fears and problems are considered and he is reassured concerning them   He can also be told of the advantages, such as the lack of bleeding and the lack of nausea and vomiting which are generally present with general anesthesia

The patient is sent to the hospital the evening before operation   Any necessary laboratory tests are made, the temperature is taken, and a urine examination is made   A sedative, usually 2 to 3 grams of sodium amytal, is administered to insure a good night's rest   The next morning the temperature is again taken   Three grams of sodium amytal is again given two hours before operation for its sedative effect and to counteract any possible idiosyncrasy to the local anesthesia   One sixth of a grain of pantopon is then given, with $\frac{1}{100}$ to $\frac{1}{150}$ grain of scopolamine, one hour before operation   Pantopon is less nauseating than morphia and scopolamine is equally as effective as atropine in drying the secretions of the pharynx, and it produces a much better mental reaction   This combination of drugs is ideal in allaying the apprehension of the nervous or excitable patient   The size of the doses may be varied to some extent   Older, frail individuals and those of the phlegmatic type as a rule require a smaller dose than the average given here

The patient is then taken to the operating room in a conveyance or wheel chair and requested to sit in the operating chair for a few minutes to accustom him to the surroundings   If there is pallor or faintness the patient's head is put forward on his knees for a few minutes and he is reassured

Administration of Anesthetic —The surgeon sits facing the patient and instructs him in breathing for a patient who holds his breath is very likely to gag, since part of the gag reflex is holding the breath   He is told that a numb swollen feeling or a feeling of a lump in the throat is to be expected,

that it is the natural result of the anesthesia and that he should endeavor to tolerate it rather than try to clear his throat which is a natural tendency

A nurse cares for the operating table and instruments and holds the tongue depressor during the operation   A second nurse or attendant steadies the patients head keeping it in the desired position during operation

The injection of the anesthetic solution   1 per cent procaine to which has been added 5 drops of 1 1000 suprarenin
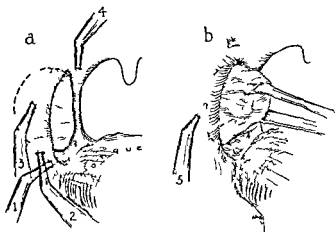
Fig 281—a The o der of superficial in e tion of anesthetic solution about the tonsil is shown (see text)   b Method of displacing the ton il medial ward and the inject on of anesthetic solut on through the anter or p llar and beh nd the tonsillar cap ule into the paratonsillar pace

(adrenalin) per ounce is begun with a sharp needle the end of which is bent at an angle of 45 degrees (Fig 281 a and b)

pillar just
ation is be

under the plica triangularis   Usually 2 5 cc of the anesthetic
The second insert on of the needle is in
and the
nsertion
le point

is carried across the top of the superior pole or the fossa to the top of the posterior pillar A fourth insertion is made near the top of the posterior pillar and carried down to the base of the tongue There is more tendency to gag during infiltration of the posterior pillar than elsewhere, yet the entire infiltration and tonsillectomy are frequently done without producing gagging No surface anesthesia is used Following the superficial infiltration about the tonsillar pillar and base of the tongue, the tonsil is grasped with a tenaculum forceps and pulled medially, the needle is again inserted through the anterior pillar into the retrotonsillar space and about 3 cc of the anesthetic solution is injected slowly When there is marked peritonsillar fibrosis from abscesses or from some other cause two or more injections may be made to insure complete anesthesia Usually a total of from 12 to 15 cc of solution is used although a larger quantity can be used if unusual conditions warrant

The second tonsil is similarly anesthetized If any debris is displaced by catching the tonsil with the tenaculum it is removed by suction Also any crypts with obvious secretion are emptied by the use of a suction tube and excess saliva is likewise removed The use of suction enables one to keep the operative field clean and the mouth dry without the inconvenience of having the patient clear his throat or stopping the operative procedure for him to expectorate This also hastens the operation and there is less opportunity for annoying bleeding to occur

Operation—To remove the tonsil it is again caught with

sion is then made beginning at the upper pole and carrying it along the reflection of the mucosa from the tonsil and along the posterior pillar to the base of the tongue This incision is carried through only the mucous membrane A similar incision is then made from above downward and forward along the anterior pillar and is carried just anterior to the lymph follicles of the pica triangularis to the tongue

The capsule of the tonsil is then exposed with a blunt tipped knife separating first the posterior pillar, then the anterior

pillar, and then across the upper pole If there is unusual fibrosis, a curved scissor may be used in this dissection After the pillars and upper pole are separated, the loop of a cold snare is slipped over the tonsil and is slowly closed, bleeding
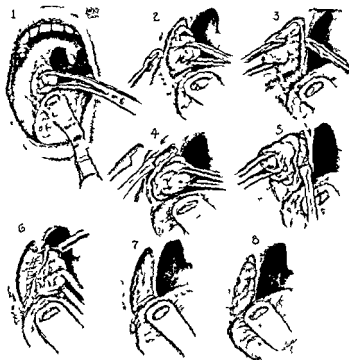
Fig 282 —1 The reflection of the mucosa from the tonsil the dotted line indicates position for the incision 2 The incision is put through the mucosa being made in the anterior pillar 3 The incision in the posterior pillar 4 and 5 Dissection with the blunt tipped knife separating the pillars from the capsule of the tonsil 6 The snare loop placed over tonsil freed from the pillars (see text) 7 The empty tonsillar fossæ 8 Tonsillar fossæ packed

and secretions are removed with the suction tube as they accumulate The tongue depressor is held by the nurse, thus permitting the surgeon to use both hands in the dissection As soon as the tonsil is separated from its bed by the snare it is removed from the mouth and a gauze sponge is quickly

packed into the tonsillar fossa to control any immediate bleeding or oozing The tonsil on the opposite side is removed in like manner and its fossa similarly packed

The area below the tonsillar fossa and along the base of the tongue is then examined for lymphoid tissue and if present this lymphoid tissue is caught with a tenaculum the snare loop again applied and the lymphoid tissue removed

The packing is then removed from the fossa from which the first tonsil was removed Any bleeding or oozing vessels are caught with a curved artery forceps and tied with No 1 plain catgut using either the fingers or the wire loop pillar retractor to draw the knot tightly over the end of the hemostat

If there is a bleeding vessel on the edge of the tongue that is not easily caught with a hemostat a suture is placed and tied A nonbreakable heavy malleable full curved needle is used on a curved end needle holder This type of needle is used to prevent the possibility of its breaking

In a great many instances this completes the operation However it is an important routine measure to examine the postnasal space the lateral pharyngeal walls and the base of the tongue using a mirror and palate retractor to inspect this entire region

Large masses of lymphoid tissue are often found on the base of the tongue along the lateral walls of the pharynx and in the adenoid region It is important that this tissue be removed to obtain the most satisfactory clinical result for it likewise can be a focus of infection as it often contains debris and retained secretion and is subject to recurrent follicular infection

In removing the lingual lymphoid tissue the anesthetic solution is injected by turning the needle downward and infiltrating the base of the tongue The lymphoid tissue is then caught with a tenaculum forceps and lifted upward from the base of the tongue The snare loop is passed over the mass engaging it and the snare closed This procedure removes the lymphoid tissue on the base of the tongue often with a fibrous capsule on its base (Figs 283 284)

Little bleeding occurs and this can usually be controlled by pressure of a sponge for a few minutes If bleeding is not

controlled, a suture is placed and tied at the point of bleeding, using the needle previously mentioned
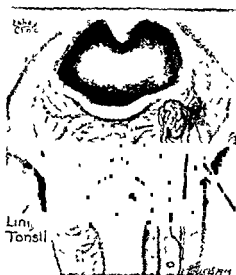
Fig 283 — The lingual tonsil The method of catching with the tenaculum and application of the snare are shown
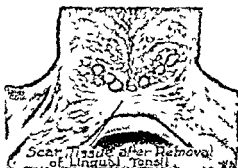
Fig 284 — Healed base of tongue after removal of lingual tonsil

The lateral pharyngeal bands are likewise removed after local infiltration of the anesthetic under the lymphoid tissue An incision is made through the mucosa along each side of the

lateral pharyngeal mass and the two incisions are connected below the end of the mass (Fig 285) The mass is grasped with the tenaculum at the lower end and stripped upward The snare loop is bent at nearly a right angle, slipped over the attached portion and upward behind the soft palate The snare loop is closed, thus removing the lateral mass as high as the eustachian tube

Routine visual examination will often reveal not only aden oid tissue but abscesses or cysts in its substance Here again the adenoid may be removed after local infiltration of the anes thetic along the lateral borders of the nasopharynx and the adenoid itself, using the upward curved needle and a palate retractor to hold the soft palate forward

The Laforce instrument or curet is often applied without pain Removal of the adenoid is not entirely satisfactory,

Fig 285—a Lateral pharyngeal lymphoid tissue b incis on about the lymphoid tissue c lymphoid tissue stripped upward and snare loop applied d linear scar after removal of lateral pharyngeal lymphoid tissue

however because discomfort and occasionally pain result from l other

refully inspected to make sure that the tissue has been cleanly re moved If any adenoid remains further application of the instruments is made until all tissue has been removed

Bleeding is controlled in the adenoid area by packing It is well to attach a string to any packing which is to remain more than a few seconds so that it will not be lost and so that it can readily be withdrawn Ordinarily the pack is held with a sponge forceps

Postoperative Care—Postoperative care is simple and consists of rest in bed, an ice collar if the patient desires it,

fluid and a soft diet three hours after operation aspirin as a gargle or other analgesics to relieve pain locally, and a sedative to insure rest

Patients who live in the immediate neighborhood and who have no disease other than their tonsillar condition usually are discharged one day after operation However, if they have a long trip to make or if they have other disease, they are kept in the hospital as long as their condition warrants

Patients are followed routinely by letter one month and again one year after operation and more frequently if special conditions warrant it At the time of discharge the patients are instructed against possible complications and are requested to report any difficulty Those who live within traveling distance are requested to return for a check up examination of the nose and throat one month after operation

Complications—When local anesthesia has been given complications have been extremely rare To date pulmonary abscesses or deep infections of the neck have not occurred in our series of approximately 3000 cases One patient had lobar pneumonia and one bronchopneumonia however after operation in each case there was complete resolution of the lung

Bleeding is the most common complication Primary bleeding—that is bleeding which occurs within the first twenty four hours after operation—has been present in approximately 1 per cent of cases Secondary bleeding or bleeding that occurs after twenty four hours usually between the fourth and ninth day has been most common and has been present in approximately 2 5 per cent of cases I have never seen secondary bleeding occur later than ten days after operation

Conclusions—In our experience local anesthesia has the following advantages there is less postoperative discomfort such as nausea and vomiting better cooperation of the patient during and after operation less operative bleeding (which is readily controlled) the cough reflex remains the surgeon is not hurried and anesthetists and assistants other than one or two nurses are unnecessary

CUMULATIVE INDEX

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